Nokia Customer Care

Service Manual

RM-265 (6500 classic)

Mobile Terminal

Part No: (Issue 1)

COMPANY CONFIDENTIAL

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
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The availability of particular products may vary by region.

IMPORTANT

This document is intended for use by qualified service personnel only.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

For your safety

QUALIFIED SERVICE

Only qualified personnel may install or repair phone equipment.

ACCESSORIES AND BATTERIES

Use only approved accessories and batteries. Do not connect incompatible products.

CONNECTING TO OTHER DEVICES

When connecting to any other device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Ni-Cd/NiMh batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77°F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Company Policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

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6500 classic Service Manual Structure

1 General information
2 Service Devices and Service Concepts
3 BB Troubleshooting and Manual Tuning Guide
4 RF troubleshooting
5 System Module
Glossary

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1 — General information

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Product selection

RM-265 (Nokia 6500) is a WCDMA/GSM dual mode phone, supporting WCDMA 850/2100 bands and EGSM850/900/1800/1900 bands.

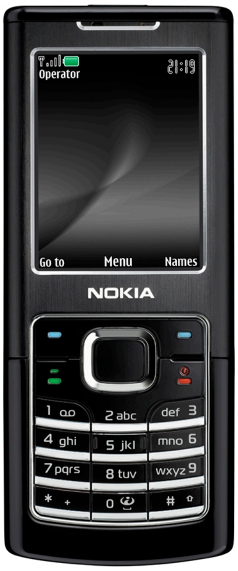

Figure 1 RM-265 (Nokia 6500 classic) product picture

Phone features

Display and keypad features

- 2" 240x320 pixel, 16M color display (30.6mm x 40.8mm active area)
- 5-way , navi-key (soft-keys, call and end keys)

Hardware features

- 2.0-megapixel camera landscape mode and 8x digital zoom and flash
- Micro USB port for headset, charging and data transfer (USB 2.0)
- Bluetooth (version 2.0)
- Music player
- Internal vibrator
- Plug-in SIM (1.8 V and 3.0 V)
- 1GB internal memory (no memory card)

RF features

- WCDMA Band I (2100) & V (850)
- GSM/EDGE 850/900/1800/1900
- EDGE: MSC 10
- GPRS: MSC 32
- HSCSD

- CSD

User interface and software features

Selection of software applications and services

- Video streaming and recording
- XHTML browsing over TCP/IP
- SAIC
- Themes (wallpapers, icons, colors)
- Music Player supporting MP3, MP4, AAC, eAAC+
- Flight mode
- OMA DRM 2.0 (Digital Right Management)
- OMA MMS 1.2, MMS Conformance 3.0, AMR and SMIL
- OMA Client Provisioning v1.1
- Java
- Video playback
- 64 polyphonic ringing tones
- WAP 2.0, XHTML browser over HTTP/TCP/IP stack
- SyncML (local and remote)
- Nokia PC Suite

Accessories

Sales package contents

- Nokia 6500 phone
- Nokia Battery BP-6P
- Nokia Charger: AC-6, Mobile DC-6
- Nokia wired headset: HS-82
- User Guide

Table 1 Battery and chargers

Type	Name
Note: This phone is charged through the micro USB port. It can also be charged via a data cable CA-101 connected to the micro USB port and in the other end to the USB port of a PC.	
DC-6	Compact charger
AC-6	Charger
BP-6C	Battery 850 mAh Li-Ion

Table 2 Car accessories

Type	Name
CK-15W	

Table 3 Headsets

Type	Name
Wired	
HS-82	Headset (wired)
Wireless	
BH-100	Wireless headset
BH-500	Wireless headset
BH-5XX	Wireless headset
BH-60X	Wireless headset
HS-89W	Wireless headset
HS-25W	Wireless headset
HS-72W	Wireless headset
HS-76W	Wireless headset

Table 4 Data cables

Type	Name
CA-101	Micro USB cable

Technical specifications

General specifications

Unit	Dimension (mm)	Weight (g)	Volume (cc)
Transceiver with BP-6P 850 mAh Li-Ion battery pack	109.8 x 45 x 9.6	94	47

Battery endurance

Battery	NMP Talk time	NMP Standby time
BP-6P 850 mAh Li-ion	Up to 5.5 Hours	12.5 Days

Note: Variation in operation times will occur depending on SIM card, network settings and usage.

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2 — Service Devices and Service Concepts

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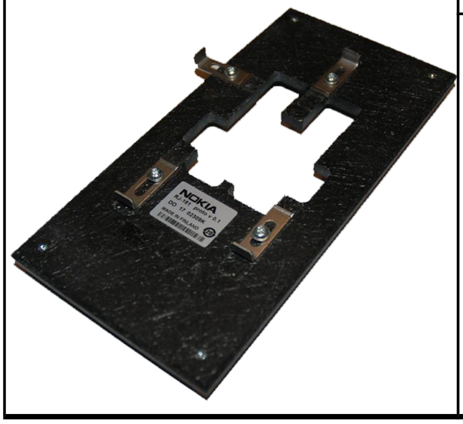
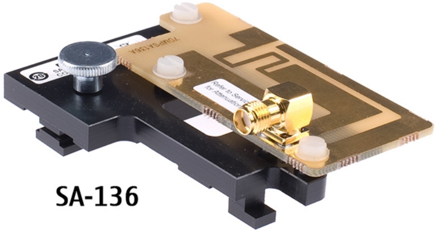
Service devices

Product specific devices

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-265, refer to various concepts.

	FS-60	Flash adapter	
	• FS-60 is equipped with a clip interlock system • provides standardised interface towards Control Unit • provides RF connection using coupler • multiplexing between USB and FBUS media, controlled by VUSB		
	MJ-146	Module jig	
	MJ-146 is meant for component level troubleshooting. The jig includes an RF interface for GSM, WCDMA and Bluetooth. In addition, it has the following features: • Provides mechanical interface with the engine module • Provides galvanic connection to all needed test pads in module • Multiplexing between USB and FBUS media, controlled by Vusb • MMC interface • Duplicated SIM connector • Connector for control unit • Access for AV- and USB connectors **Note:** Be careful when closing the jig, not to harm the display with the screws on the jig!		
	RJ-181	Rework jig	
	RJ-181 is a jig used for soldering and as a rework jig for the engine module.		



SA-136

SA-136	RF coupler	

SA-136 is an RF coupler for WCDMA and GSM RF testing. It is used together with SS-46 and SS-62.

The following table shows attenuations from the antenna pads of the mobile terminal to the SMA connectors of SA-136:

Frequency	Att. (dB)
GSM850 TX	Low: 6,5 Mid: 5,7 High: 5,0
GSM850 RX	Low: 4,2 Mid: 4,0 High: 3,9
GSM900 TX	Low: 4,0 Mid: 3,8 High: 3,7
GSM900 RX	Low: 4,1 Mid: 4,9 High: 5,9
GSM1800 TX	Low: 6,0 Mid: 5,3 High: 4,8
GSM1800 RX	Low: 4,7 Mid: 4,6 High: 4,3
GSM1900 TX	Low: 4,5 Mid: 4,2 High: 4,1
GSM1900 RX	Low: 4,2 Mid: 4,0 High: 4,2
WCDMA850 TX	Low: 6,2 Mid: 5,7 High: 5,1
WCDMA850 RX	Low: 4,2 Mid: 4,1 High: 3,9
WCDMA1920 TX	Low: 4,2 Mid: 4,0 High: 4,0
WCDMA1920 RX	Low: 5,0 Mid: 4,9 High: 4,8

General devices

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-265, refer to various concepts.

CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

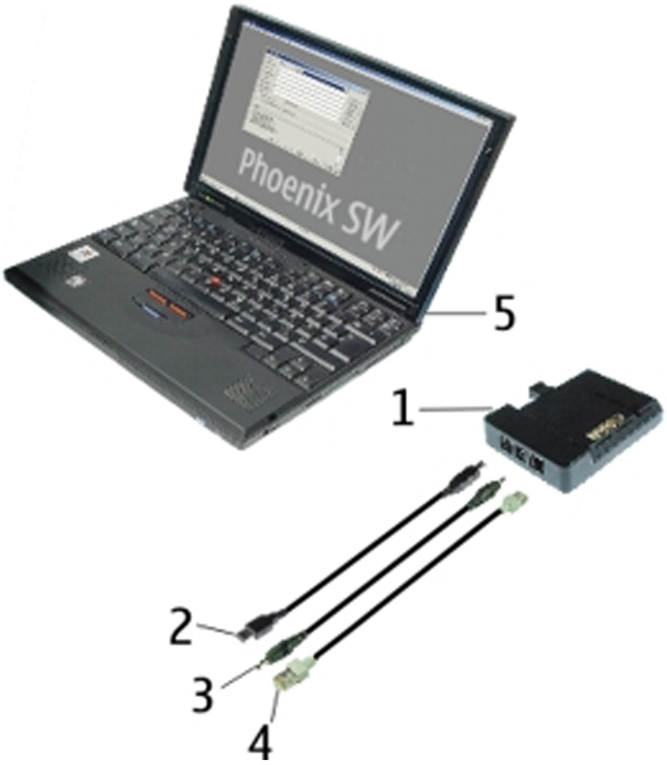
The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

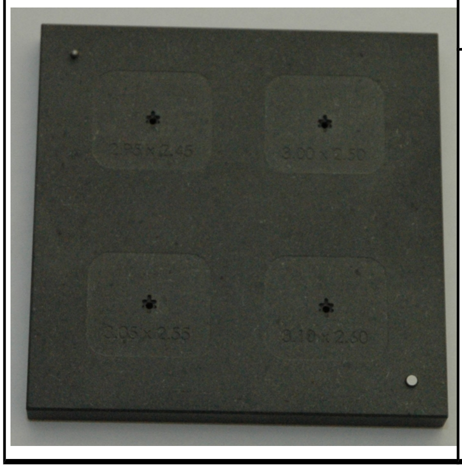
1. Connect a service tool (jig, flash adapter) to CU-4.
2. Connect CU-4 to your PC with a USB cable.
3. Connect supply voltage (12 V)
4. Connect an FBUS cable (if necessary).
5. Start Phoenix service software.

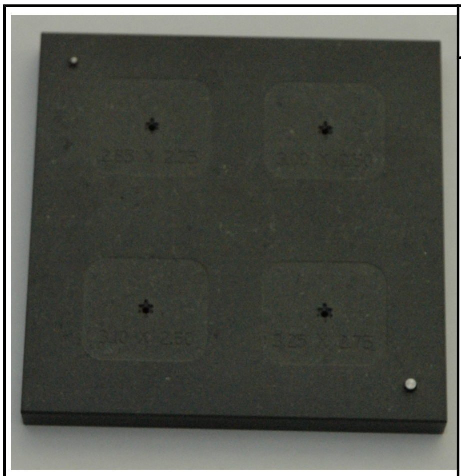
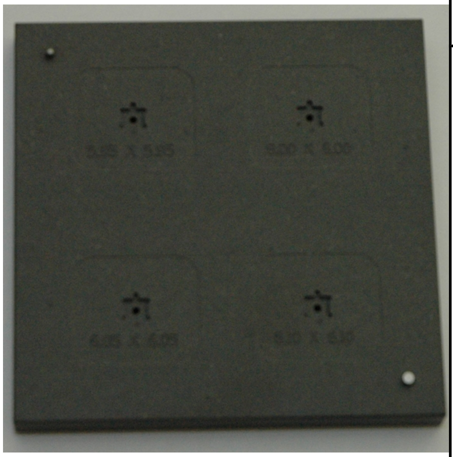
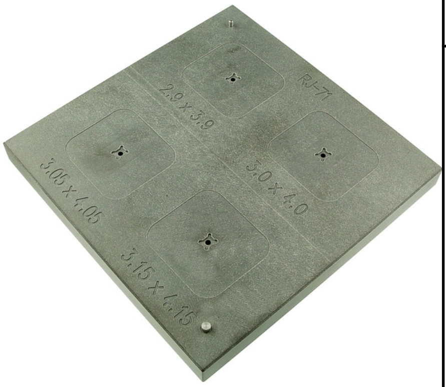


Note: Phoenix enables CU-4 regulators via USB when it is started.

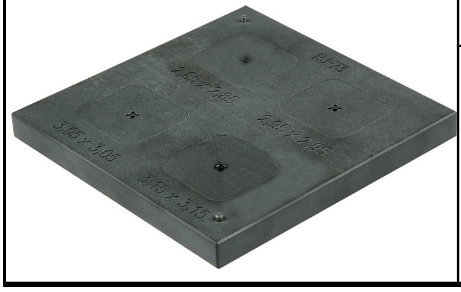
Reconnecting the power supply requires a Phoenix restart.

	FLS-5	Flash device	FLS-5 is a dongle and flash device incorporated into one package, developed specifically for POS use. **Note:** FLS-5 can be used as an alternative to PKD-1.
	FPS-10	Flash prommer	FPS-10 interfaces with: • PC • Control unit • Flash adapter • Smart card FPS-10 flash prommer features: • Flash functionality for BB5 and DCT-4 terminals • Smart Card reader for SX-2 or SX-4 • USB traffic forwarding • USB to FBUS/Flashbus conversion • LAN to FBUS/Flashbus and USB conversion • Vusb output switchable by PC command FPS-10 sales package includes: • FPS-10 prommer • Power Supply with 5 country specific cords • USB cable **Note:** FPS-21 is substitute FPS-10 if FPS-10 has not been set up.
	JBT-9	Bluetooth test and interface box (sales package)	The JBT-9 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing . Sales package includes: • JBT-9 test box • Installation and warranty information

	JXS-1	RF shield box	Because the WCDMA network disturbs the RX side testing of the WCDMA phone and the Tx signal of the WCDMA phone can severely disturb the WCDMA network, a shield box is needed in all testing, tuning and fault finding which requires WCDMA RF signal. The shield box is not an active device, it contains only passive filtering components for RF attenuation.
	PK-1	Software protection key	PK-1 is a hardware protection key with a USB interface. It has the same functionality as the PKD-1 series dongle. PK-1 is meant for use with a PC that does not have a series interface. To use this USB dongle for security service functions please register the dongle in the same way as the PKD-1 series dongle.
	PKD-1	SW security device	SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC. Without the device, it is not possible to use the service software. Printer or any such device can be connected to the PC through the device if needed.
	RJ-157	Rework jig	RJ-157 is a jig used for soldering and as a rework jig for the engine module. It is used together with the ST-55 stencil.

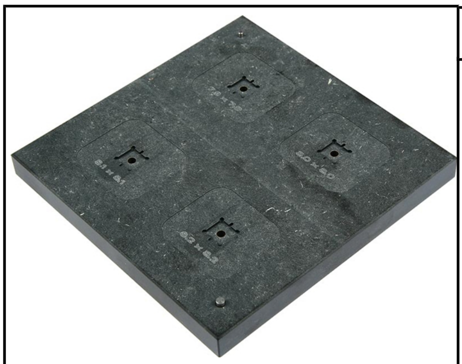
<table>
<tr><td rowspan="2"></td><td>RJ-160</td><td>Rework jig</td><td></td></tr>
<tr><td colspan="3">RJ-160 is a rework jig used when servicing the WCDMA duplexer (Z7541). It is used together with the ST-55 stencil.</td></tr>
<tr><td rowspan="2"></td><td>RJ-169</td><td>Rework jig</td><td></td></tr>
<tr><td colspan="3">RJ-169 is a jig used for soldering and as a rework jig for the engine module. It is used together with the ST-59 stencil.</td></tr>
<tr><td rowspan="2">

RJ-71
2.9 x 3.9
3.0 x 4.0
3.05 x 4.05
3.15 x 4.15

</td><td>RJ-71</td><td>Rework jig</td><td></td></tr>
<tr><td colspan="3">RJ-71 is a rework jig used with ST-26 rework stencil.</td></tr>
<tr><td rowspan="2">

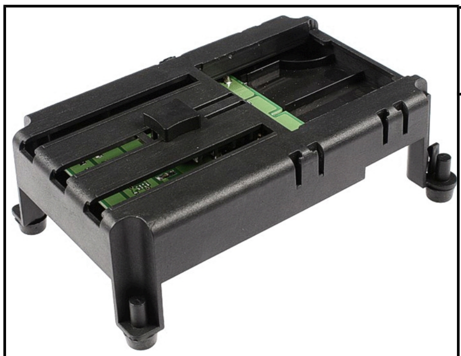
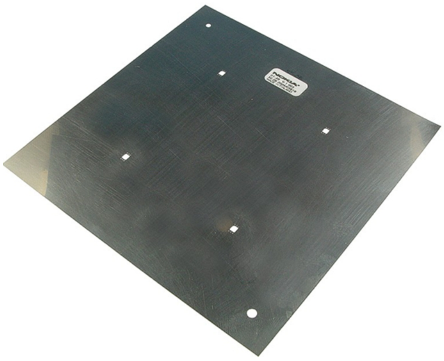
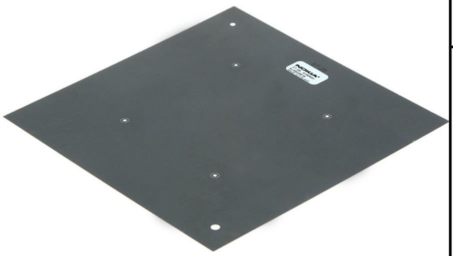
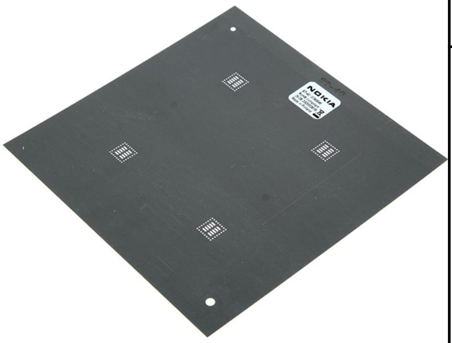
RJ-73
3.05 x 3.05
3.15 x 3.15

</td><td>RJ-73</td><td>Rework jig</td><td></td></tr>
<tr><td colspan="3">RJ-73 is a rework jig used with ST-29.</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>RJ-93</td><td>Rework jig</td><td></td></tr>
<tr><td colspan="3">RJ-93 is used as a rework jig for the engine module.
This stencil takes the front end module (FEM) or power amplifier (PA) module for spreading the soldering paste to the component. Must be used together with the ST-40 stencil.</td></tr>
<tr><td rowspan="2">

NOKIA
SPS-1
MADE IN FINLAND

</td><td>SPS-1</td><td>Soldering Paste Spreader</td><td></td></tr>
<tr><td colspan="3">The SPS-1 allows spreading of solder to the LGA components pads over the rework stencils.</td></tr>
<tr><td rowspan="2"> </td><td>SRT-6</td><td>Opening tool</td><td></td></tr>
<tr><td colspan="3">SRT-6 is used to open phone covers.</td></tr>
<tr><td rowspan="2"> </td><td>SS-46</td><td>Interface adapter</td><td></td></tr>
<tr><td colspan="3">SS-46 acts as an interface adapter between the flash adapter and FPS-10.</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>SS-62</td><td>Generic flash adapter base for BB5</td><td></td></tr>
<tr><td colspan="3">- generic base for flash adapters and couplers
- SS-62 equipped with a clip interlock system
- provides standardised interface towards Control Unit
- provides RF connection using galvanic connector or coupler
- multiplexing between USB and FBUS media, controlled by VUSB</td></tr>
<tr><td rowspan="2"></td><td>ST-26</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-26 is a rework stencil used with rework jig RJ-71.</td></tr>
<tr><td rowspan="2"></td><td>ST-29</td><td>rework stencil</td><td></td></tr>
<tr><td colspan="3">This stencil is to be used together with RJ-73.</td></tr>
<tr><td rowspan="2"></td><td>ST-40</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-40 is a rework stencil and used with RJ-93.</td></tr>
<tr><td rowspan="2"> </td><td>ST-55</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-55 is a rework stencil used with rework jig RJ-157 and RJ-160.</td></tr>
</table>

	ST-55	Rework stencil	
	ST-55 is a rework stencil used when servicing the Z7540 and Z7541 duplexers. It is used together with the rework jigs RJ-157 and RJ-160.		
	ST-59	Rework stencil	
	ST-59 is a rework stencil used with rework jig RJ-169.		
	SX-4	Smart card	
	SX-4 is a BB5 security device used to protect critical features in tuning and testing. SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.		

Cables

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-265, refer to various concepts.

CA-101 100cm	CA-101	Micro USB cable	
	The CA-101 is a USB-to-microUSB data cable that allows connections between the PC and the phone.		

<table>
<tr><td rowspan="2"> </td><td>CA-31D</td><td>USB cable</td><td></td></tr>
<tr><td colspan="3">The CA-31D USB cable is used to connect FPS-10 or FPS-11 to a PC. It is included in the FPS-10 and FPS-11 sales packages.</td></tr>
<tr><td rowspan="2"> </td><td>CA-35S</td><td>Power cable</td><td></td></tr>
<tr><td colspan="3">CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.</td></tr>
<tr><td rowspan="2"> </td><td>PCS-1</td><td>Power cable</td><td></td></tr>
<tr><td colspan="3">The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled voltage.</td></tr>
</table>

<table>
<tr><td rowspan="2"> </td><td>XCS-4</td><td>Modular cable</td><td></td></tr>
<tr><td colspan="3">XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.</td></tr>
<tr><td rowspan="2"> </td><td>XRF-1</td><td>RF cable</td><td></td></tr>
<tr><td colspan="3">The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment.
SMA to N-Connector ca. 610mm.
Attenuation for:
• GSM850/900: 0.3+-0.1 dB
• GSM1800/1900: 0.5+-0.1 dB
• WLAN: 0.6+-0.1dB</td></tr>
</table>

Service concepts

POS (Point of Sale) flash concept

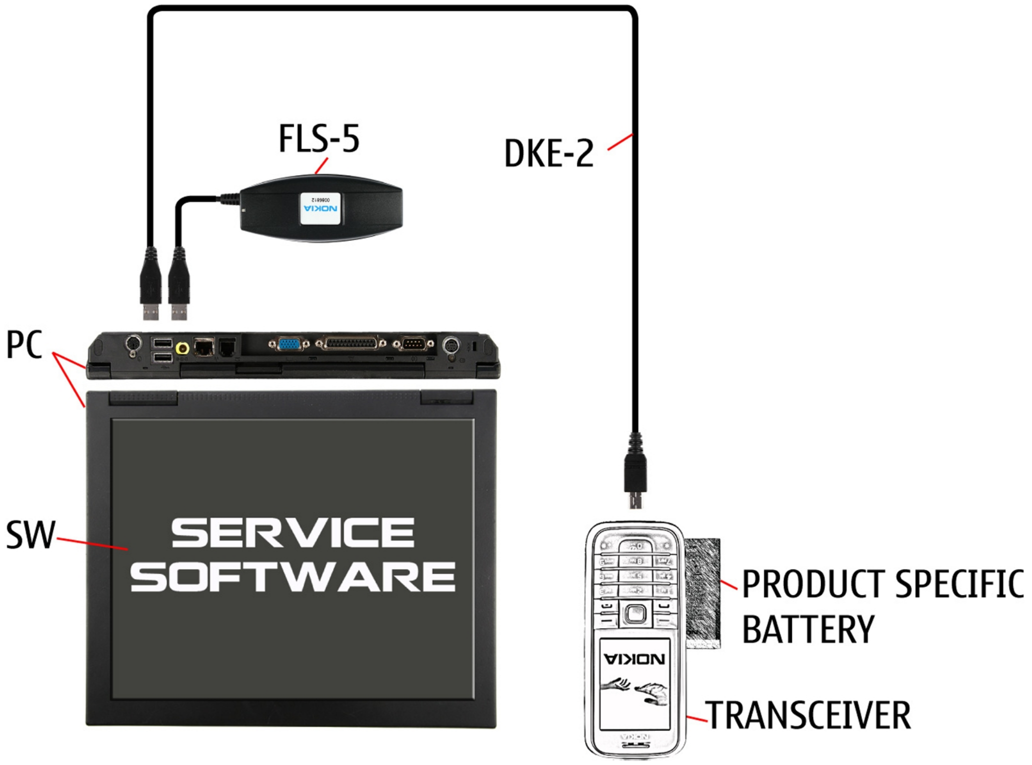

FLS-5
DKE-2
PC
SW
SERVICE SOFTWARE
PRODUCT SPECIFIC BATTERY
TRANSCEIVER

Figure 2 POS flash concept

Type	Description
Product specific tools	
BP-5C	Battery
Other tools	
FLS-5	POS flash dongle
	PC with Phoenix service software
Cables	
DKE-2	USB connectivity cable

Flash concept with FPS-10

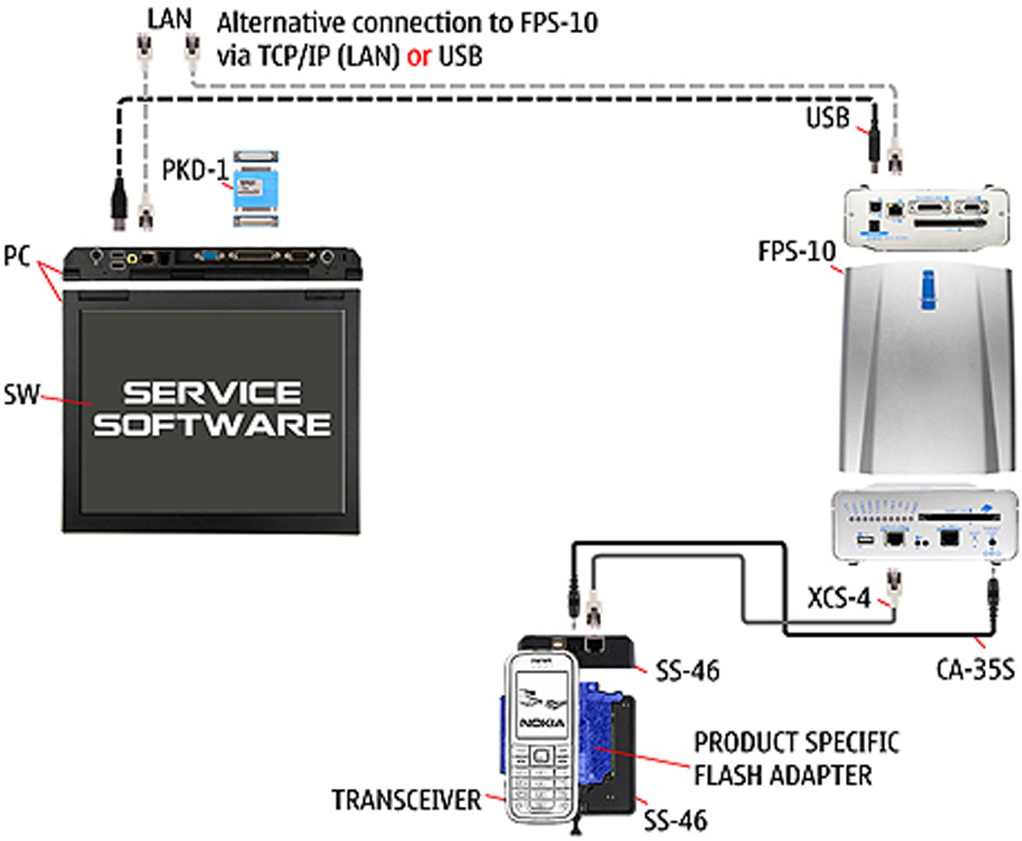

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
PKD-1
PC
FPS-10
SW
SERVICE
SOFTWARE
XCS-4
SS-46
CA-35S
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
SS-46

Figure 3 Basic flash concept with FPS-10

Type	Description
Product specific devices	
FS-53	Flash adapter
Other devices	
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software

Type	Description
Cables	
XCS-4	Modular cable
CA-35S	Power cable
	USB cable

CU-4 flash concept with FPS-10

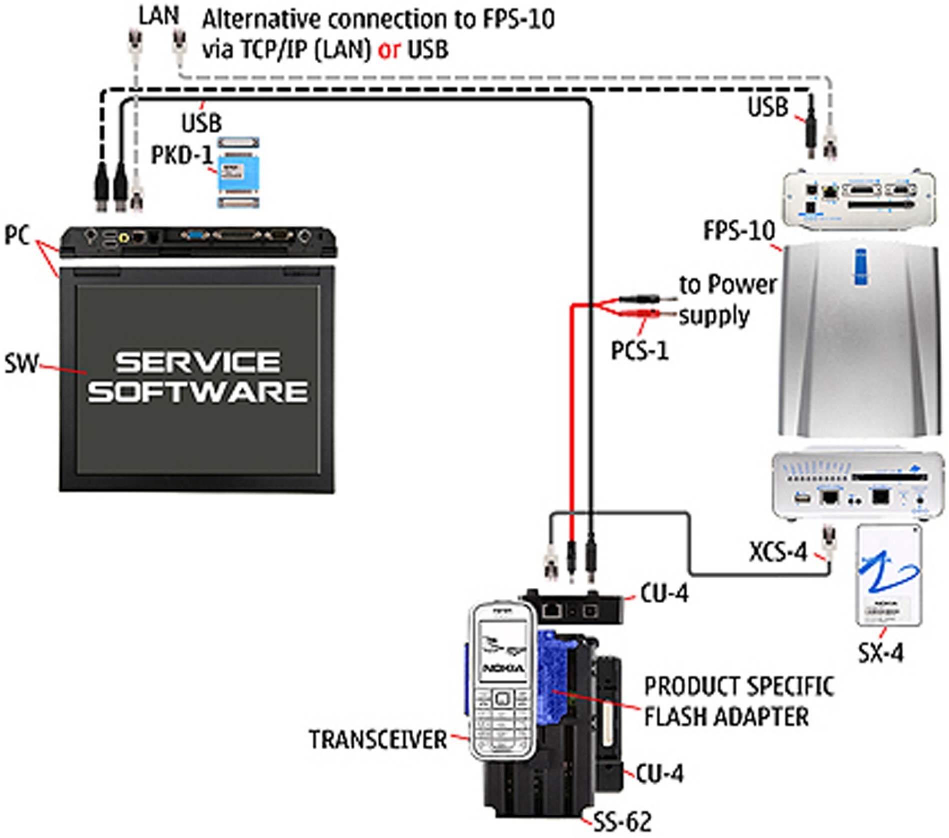

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
PKD-1
USB
PC
FPS-10
to Power
supply
PCS-1
SW
SERVICE
SOFTWARE
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
CU-4
SS-62

Figure 4 CU-4 flash concept with FPS-10

Type	Description
Product specific devices	
FS-53	Flash adapter
Other devices	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card
	PC with Phoenix service software
Cables	

Type	Description
PCS-1	Power cable
XCS-4	Modular cable
	Standard USB cable
	USB cable

Module jig service concept

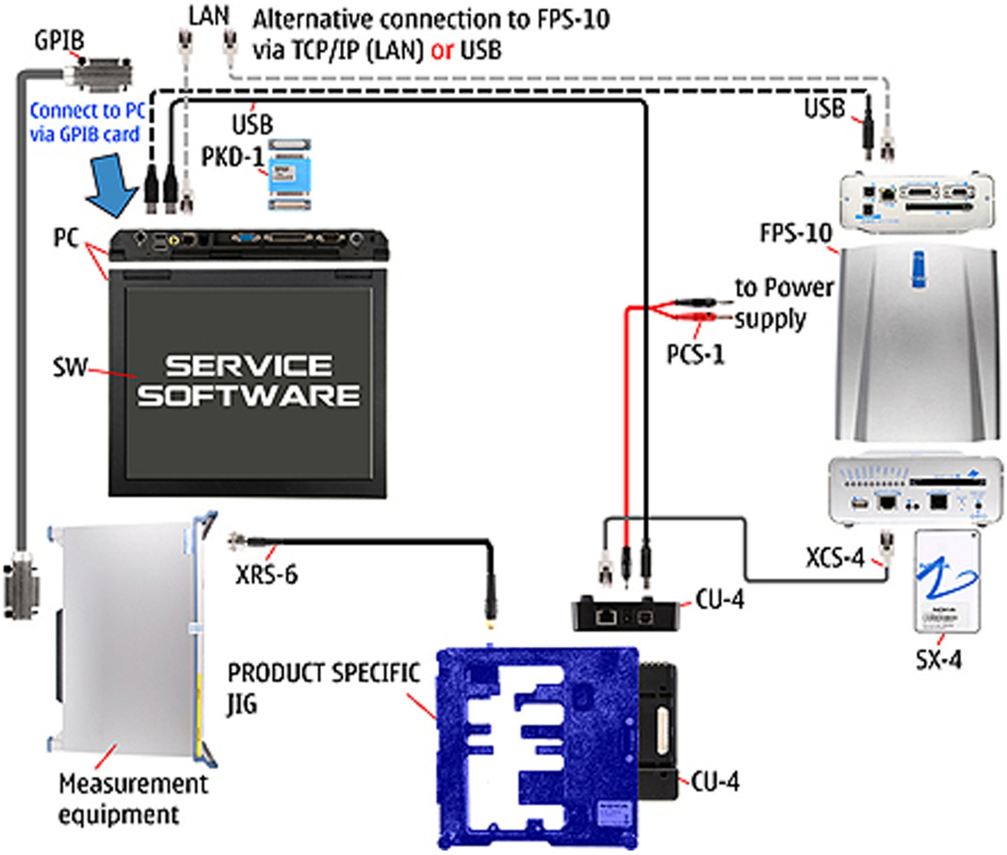

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
GPIB
Connect to PC
via GPIB card
USB
PKD-1
USB
FPS-10
PC
to Power
supply
PCS-1
SW
SERVICE
SOFTWARE
XRS-6
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC
JIG
CU-4
Measurement
equipment

Figure 5 Module jig service concept

Type	Description
Phone specific devices	
MJ-116	Module jig
Other devices	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SX-4	Smart card
	PC with VPOS and Phoenix service software
	Measurement equipment

Type	Description
Cables	
PCS-1	DC power cable
XCS-4	Modular cable
XRF-1	RF cable
	USB cable
	GPIB control cable

RF testing concept with RF coupler

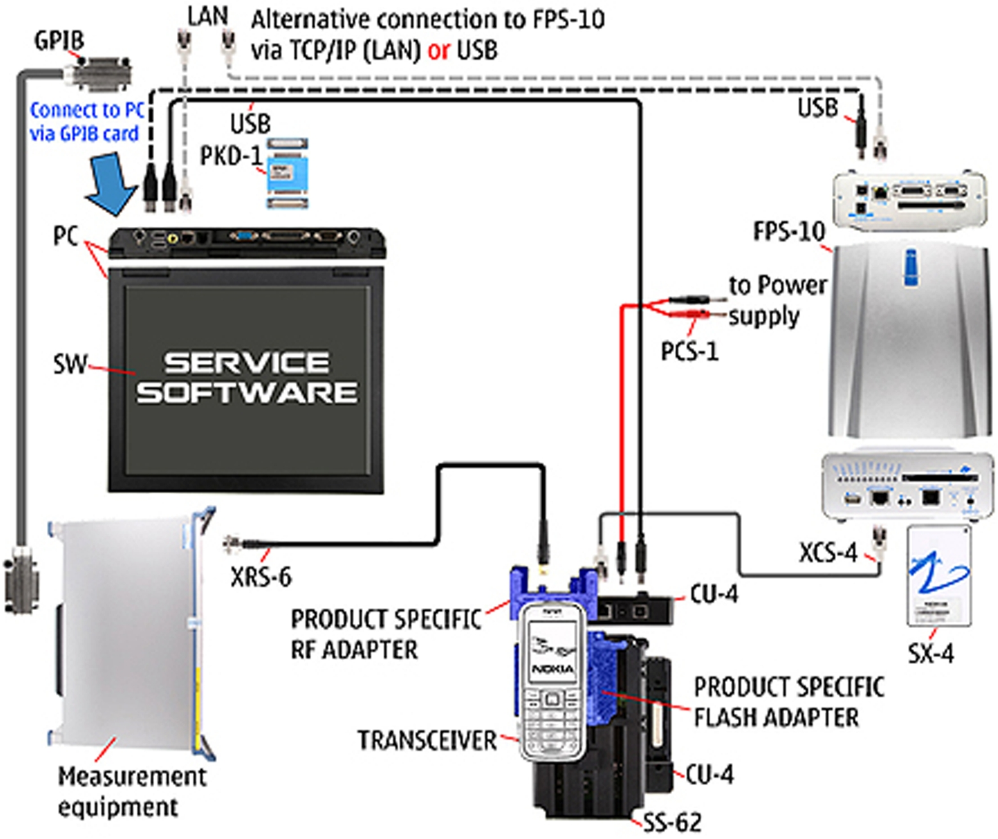

GPIB
LAN
Alternative connection to FPS-10 via TCP/IP (LAN) or USB
Connect to PC via GPIB card
USB
PKD-1
USB
PC
FPS-10
to Power supply
PCS-1
SW
SERVICE SOFTWARE
XRS-6
XCS-4
CU-4
PRODUCT SPECIFIC RF ADAPTER
SX-4
PRODUCT SPECIFIC FLASH ADAPTER
TRANSCEIVER
CU-4
Measurement equipment
SS-62

Figure 6 RF testing concept with RF coupler

Type	Description
Product specific devices	
FS-53	Flash adapter
SA-101	RF coupler
Other devices	
CU-4	Control unit
SX-4	Smart card
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device

Type	Description
SS-62	Flash adapter base
	Measurement equipment
	PC with Phoenix service software
Cables	
PCS-1	Power cable
XCS-4	Modular cable
XRS-6	RF cable
	GPIB control cable
	USB cable

Service concept for RF testing and RF/BB tuning

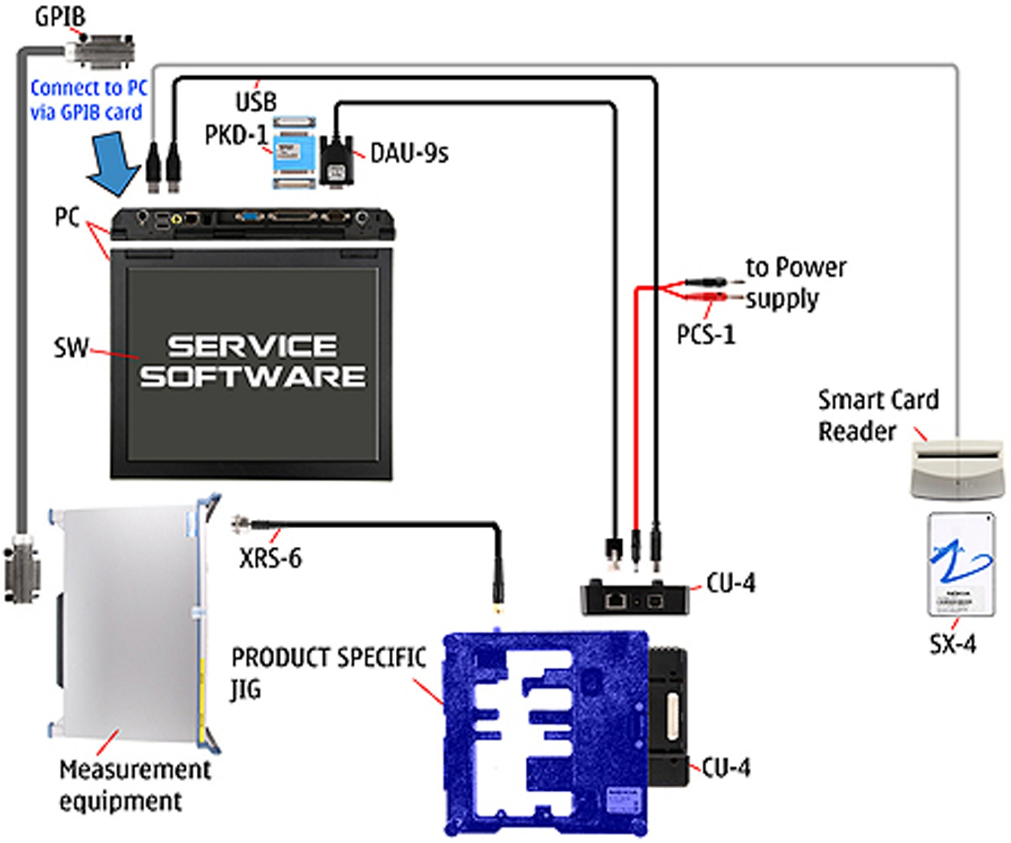

GPIB
Connect to PC via GPIB card
USB
PKD-1
DAU-9s
PC
to Power supply
PCS-1
SW
SERVICE SOFTWARE
Smart Card Reader
XRS-6
CU-4
SX-4
PRODUCT SPECIFIC JIG
Measurement equipment
CU-4

Figure 7 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
MJ-116	Module jig
Other devices	
CU-4	Control unit

Type	Description
PKD-1/PK-1	SW security device
SX-4	Smart card
	Measurement equipment
	Smart card reader
	PC with Phoenix service software
Cables	
DAU-9s	MBUS cable
PCS-1	DC power cable
XRS-6	RF cable
	GPIB control cable
	USB cable

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3 — BB Troubleshooting and Manual Tuning Guide

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    Dead or jammed device troubleshooting 3–7
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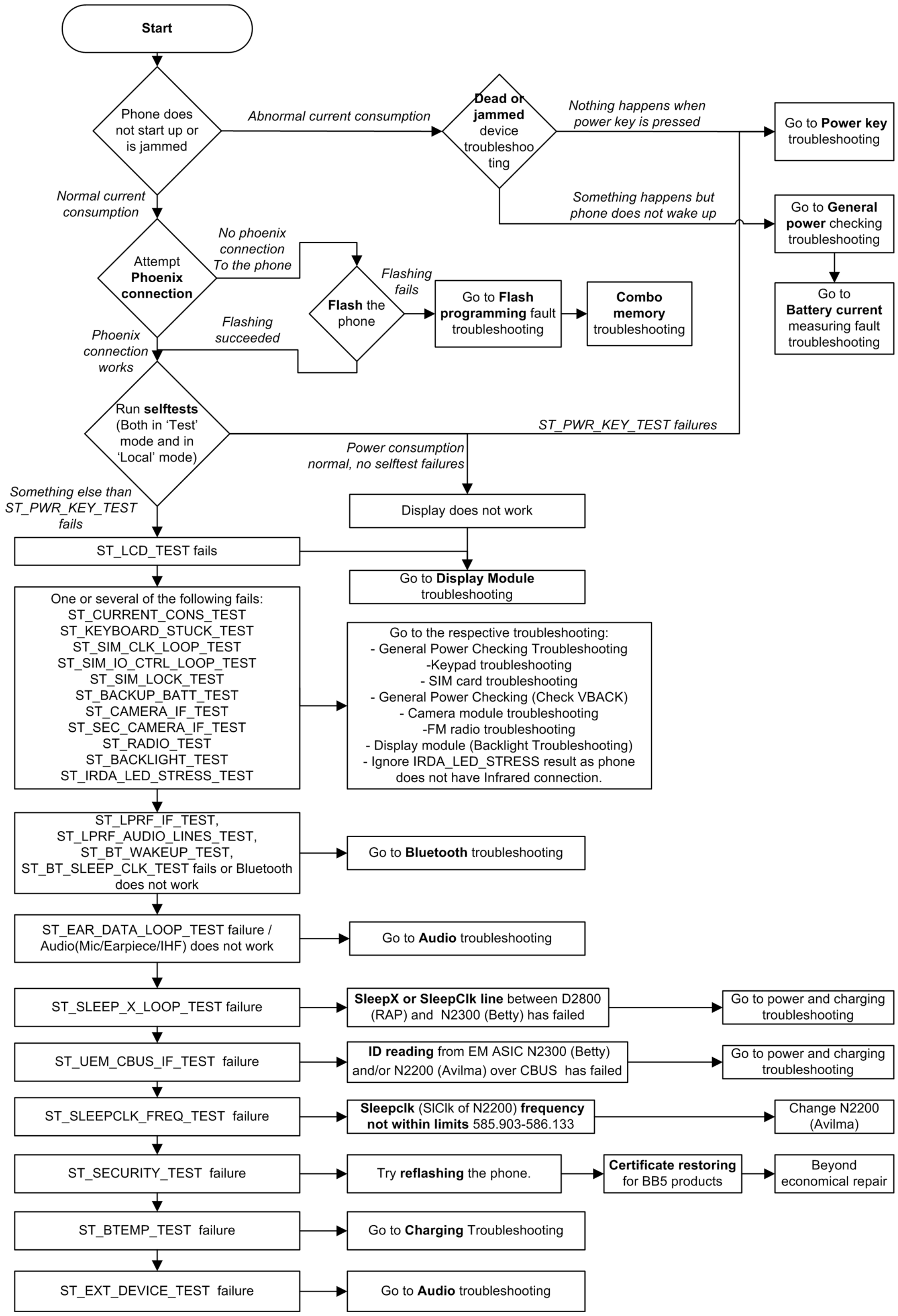
Baseband self tests in Phoenix

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

If the phone is dead and you cannot perform the self tests, go to *Dead or jammed device troubleshooting.*

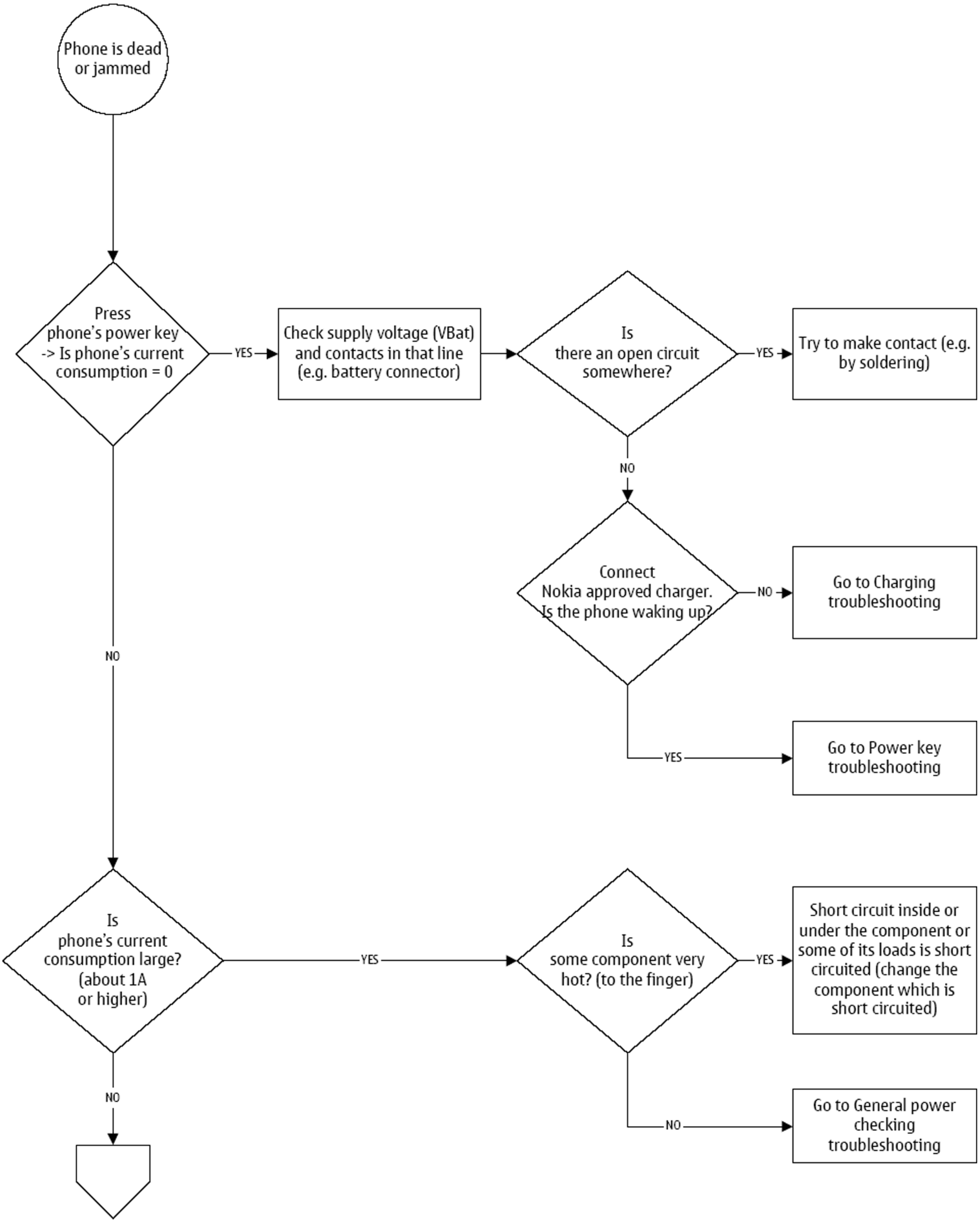
Troubleshooting flow


Start
Phone does not start up or is jammed
Abnormal current consumption
Dead or jammed device troubleshooting
Nothing happens when power key is pressed
Go to Power key troubleshooting
Something happens but phone does not wake up
Go to General power checking troubleshooting
Go to Battery current measuring fault troubleshooting
Normal current consumption
Attempt Phoenix connection
No phoenix connection To the phone
Flashing fails
Flash the phone
Go to Flash programming fault troubleshooting
Combo memory troubleshooting
Flashing succeeded
Phoenix connection works
Run selftests (Both in 'Test' mode and in 'Local' mode)
ST_PWR_KEY_TEST failures
Power consumption normal, no selftest failures
Display does not work
Something else than ST_PWR_KEY_TEST fails
ST_LCD_TEST fails
Go to Display Module troubleshooting
One or several of the following fails: ST_CURRENT_CONS_TEST ST_KEYBOARD_STUCK_TEST ST_SIM_CLK_LOOP_TEST ST_SIM_IO_CTRL_LOOP_TEST ST_SIM_LOCK_TEST ST_BACKUP_BATT_TEST ST_CAMERA_IF_TEST ST_SEC_CAMERA_IF_TEST ST_RADIO_TEST ST_BACKLIGHT_TEST ST_IRDA_LED_STRESS_TEST
Go to the respective troubleshooting: - General Power Checking Troubleshooting -Keypad troubleshooting - SIM card troubleshooting - General Power Checking (Check VBACK) - Camera module troubleshooting -FM radio troubleshooting - Display module (Backlight Troubleshooting) - Ignore IRDA_LED_STRESS result as phone does not have Infrared connection.
ST_LPRF_IF_TEST, ST_LPRF_AUDIO_LINES_TEST, ST_BT_WAKEUP_TEST, ST_BT_SLEEP_CLK_TEST fails or Bluetooth does not work
Go to Bluetooth troubleshooting
ST_EAR_DATA_LOOP_TEST failure / Audio(Mic/Earpiece/IHF) does not work
Go to Audio troubleshooting
ST_SLEEP_X_LOOP_TEST failure
SleepX or SleepClk line between D2800 (RAP) and N2300 (Betty) has failed
Go to power and charging troubleshooting
ST_UEM_CBUS_IF_TEST failure
ID reading from EM ASIC N2300 (Betty) and/or N2200 (Avilma) over CBUS has failed
Go to power and charging troubleshooting
ST_SLEEPCLK_FREQ_TEST failure
Sleepclk (SlClk of N2200) frequency not within limits 585.903-586.133
Change N2200 (Avilma)
ST_SECURITY_TEST failure
Try reflashing the phone.
Certificate restoring for BB5 products
Beyond economical repair
ST_BTEMP_TEST failure
Go to Charging Troubleshooting
ST_EXT_DEVICE_TEST failure
Go to Audio troubleshooting

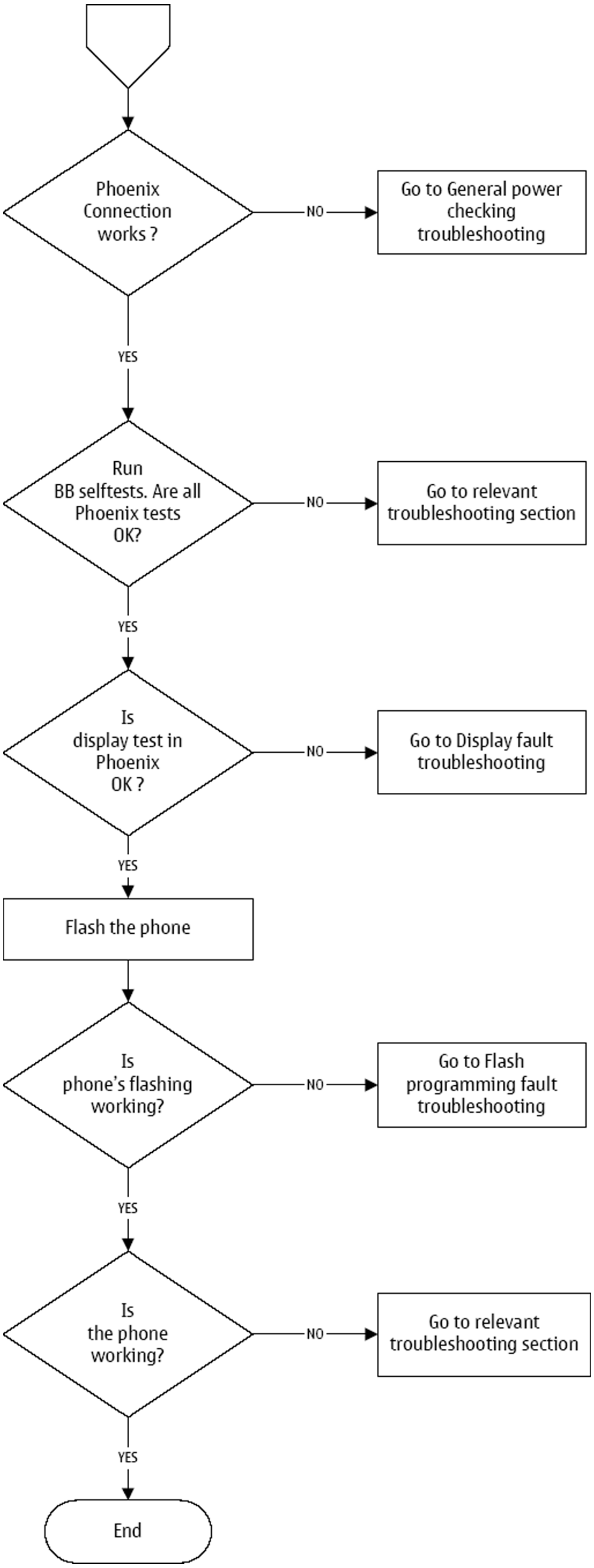
Power and charging troubleshooting

Dead or jammed device troubleshooting

Troubleshooting flow


Phone is dead or jammed
Press phone's power key -> Is phone's current consumption = 0
YES
Check supply voltage (VBat) and contacts in that line (e.g. battery connector)
Is there an open circuit somewhere?
YES
Try to make contact (e.g. by soldering)
NO
Connect Nokia approved charger. Is the phone waking up?
NO
Go to Charging troubleshooting
YES
Go to Power key troubleshooting
NO
Is phone's current consumption large? (about 1A or higher)
YES
Is some component very hot? (to the finger)
YES
Short circuit inside or under the component or some of its loads is short circuited (change the component which is short circuited)
NO
Go to General power checking troubleshooting
NO

Troubleshooting flow


Phoenix Connection works ?
NO
Go to General power checking troubleshooting
YES
Run BB selftests. Are all Phoenix tests OK?
NO
Go to relevant troubleshooting section
YES
Is display test in Phoenix OK ?
NO
Go to Display fault troubleshooting
YES
Flash the phone
Is phone's flashing working?
NO
Go to Flash programming fault troubleshooting
YES
Is the phone working?
NO
Go to relevant troubleshooting section
YES
End

General power checking

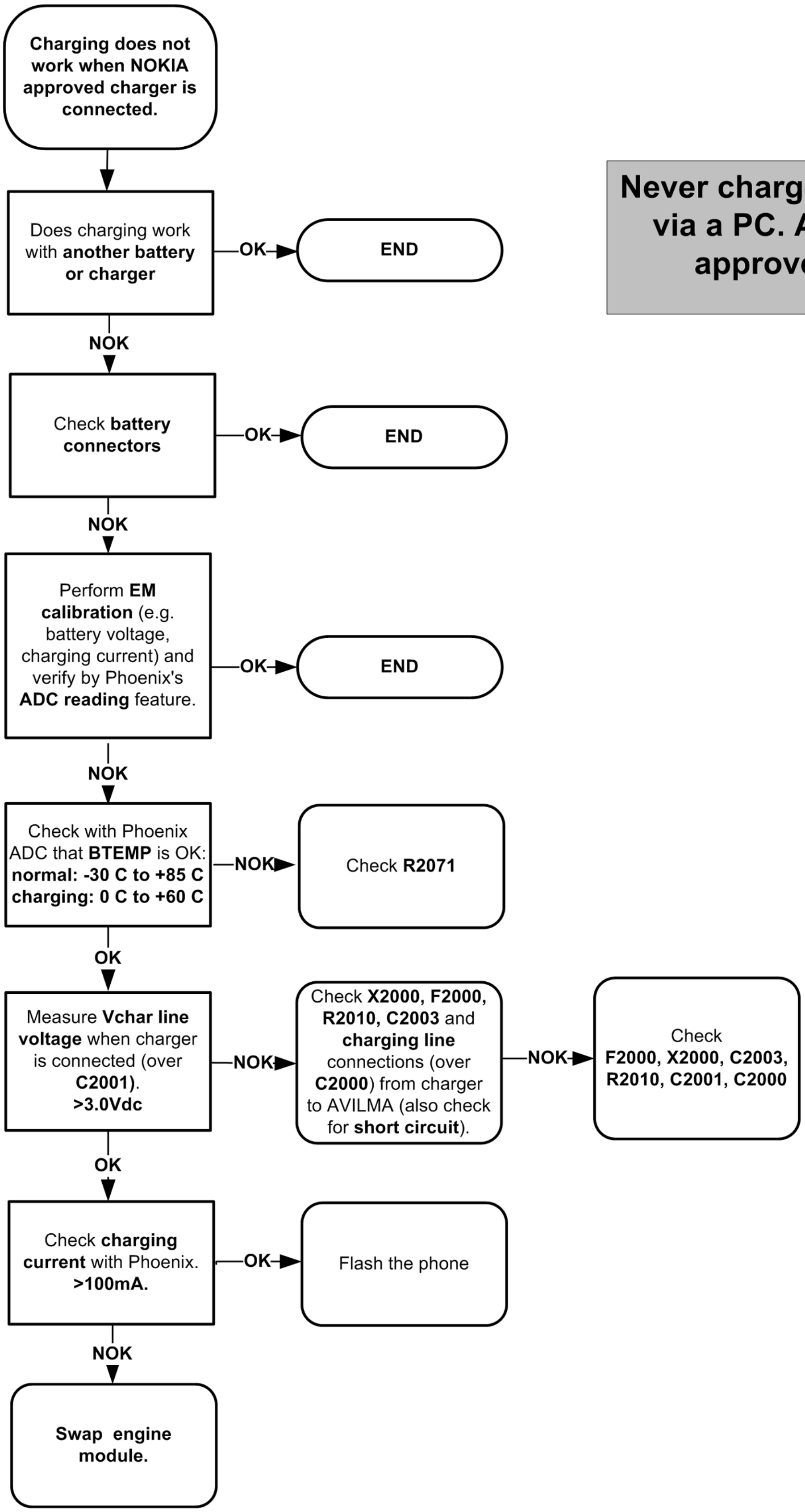
Check the following voltages:

Signal name	Regulator	Sleep	Idle	Nominal voltage	Main user	Notes
VIO	AVILMA	ON	ON	1.82	Memory, I/Os, Display	
VBACK	AVILMA	ON	ON	2.5	Back-up battery	
VSIM1	AVILMA	ON	ON	1.8/3.0	SIM card	
VDRAM	AVILMA	ON	ON	1.82	SDRAM	
VAUX	AVILMA	OFF	OFF	2.5	Camera, ALS, Display	
VR1	AVILMA	OFF	ON	2.5	Crystal oscillators, Ahneus	
VRFC	AVILMA	OFF	ON	1.8	RAP3G converters	
VRCP1	AVILMA			4.75	To RF parts	RF active
VREF	AVILMA	ON	ON	1.35	RF reference	
VCORE	BETTY	ON	ON	1.05 1.25 1.35 1.40	RAP3G digital	
VOUT	BETTY	OFF	OFF	2.5		Accessory connected
VCAM_2V8	LP3987ITLX-2.85/N3351	OFF	OFF	2.850	Camera	Disabled in sleep
VCAM_1V8	LM3677TLX-1.82/N3350	OFF	OFF	1.800	Camera	Disabled in sleep
VSIM2_MMC	KMBGN000A/D4800	OFF	OFF	2.850	Internal memory	Disabled in sleep
VLEDOUT	TPS61061/N2301	OFF	OFF	14.5	LCD Backlight	Disabled in sleep

Charging troubleshooting

Troubleshooting flow

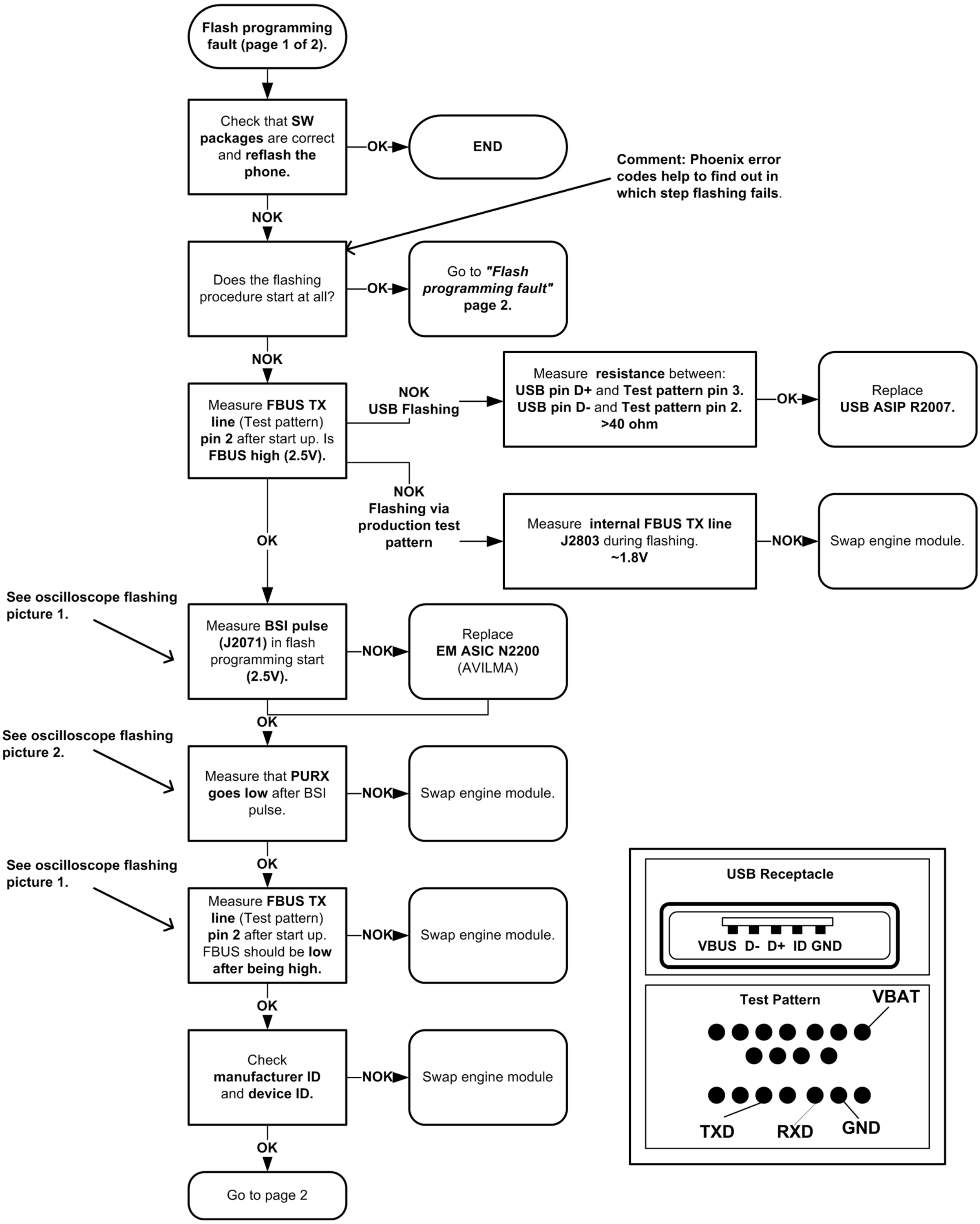
Never charge a *dead* battery via a PC. Always use an approved charger.


Charging does not work when NOKIA approved charger is connected.
Does charging work with another battery or charger
OK
END
NOK
Check battery connectors
OK
END
NOK
Perform EM calibration (e.g. battery voltage, charging current) and verify by Phoenix's ADC reading feature.
OK
END
NOK
Check with Phoenix ADC that BTEMP is OK: normal: -30 C to +85 C charging: 0 C to +60 C
NOK
Check R2071
OK
Measure Vchar line voltage when charger is connected (over C2001). >3.0Vdc
NOK
Check X2000, F2000, R2010, C2003 and charging line connections (over C2000) from charger to AVILMA (also check for short circuit).
NOK
Check F2000, X2000, C2003, R2010, C2001, C2000
OK
Check charging current with Phoenix. >100mA.
OK
Flash the phone
NOK
Swap engine module.

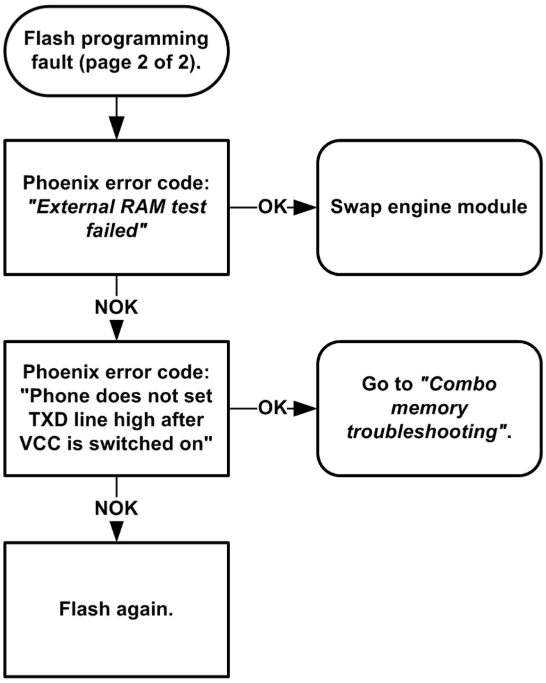
Interface troubleshooting

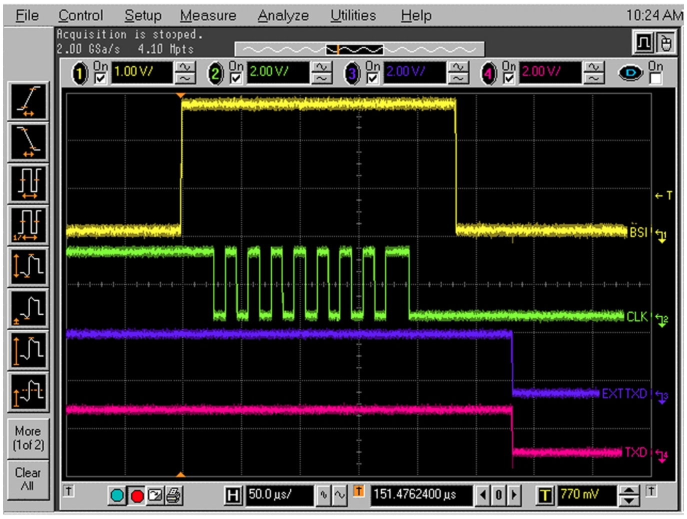
Flash programming fault troubleshooting

Part 1


Flash programming fault (page 1 of 2).
Check that SW packages are correct and reflash the phone.
OK
END
Comment: Phoenix error codes help to find out in which step flashing fails.
NOK
Does the flashing procedure start at all?
OK
Go to "Flash programming fault" page 2.
NOK
Measure FBUS TX line (Test pattern) pin 2 after start up. Is FBUS high (2.5V).
NOK USB Flashing
Measure resistance between: USB pin D+ and Test pattern pin 3. USB pin D- and Test pattern pin 2. >40 ohm
OK
Replace USB ASIP R2007.
NOK Flashing via production test pattern
Measure internal FBUS TX line J2803 during flashing. ~1.8V
NOK
Swap engine module.
OK
See oscilloscope flashing picture 1.
Measure BSI pulse (J2071) in flash programming start (2.5V).
NOK
Replace EM ASIC N2200 (AVILMA)
OK
See oscilloscope flashing picture 2.
Measure that PURX goes low after BSI pulse.
NOK
Swap engine module.
OK
See oscilloscope flashing picture 1.
Measure FBUS TX line (Test pattern) pin 2 after start up. FBUS should be low after being high.
NOK
Swap engine module.
OK
Check manufacturer ID and device ID.
NOK
Swap engine module
OK
Go to page 2
USB Receptacle
VBUS D- D+ ID GND
Test Pattern
VBAT
TXD
RXD
GND

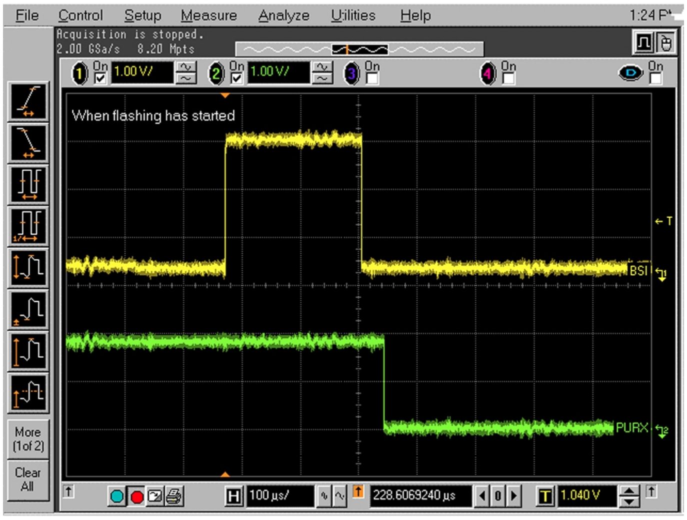
Part 2


Flash programming fault (page 2 of 2).
Phoenix error code: *"External RAM test failed"*
OK
Swap engine module
NOK
Phoenix error code: "Phone does not set TXD line high after VCC is switched on"
OK
Go to *"Combo memory troubleshooting"*.
NOK
Flash again.


File
Control
Setup
Measure
Analyze
Utilities
Help
10:24 AM
2.00 GSa/s 4.10 Mpts
1 On 1.00 V/
2 On 2.00 V/
3 On 2.00 V/
4 On 2.00 V/
On
BSI
CLK
EXTTXD
TXD
More (1of 2)
Clear All
H 50.0 µs/
151.4762400 µs
T 770 mV

Acquisition is stopped.

Figure 8 Flashing pic 1. Take single trig measurement for the rise of the BSI signal.



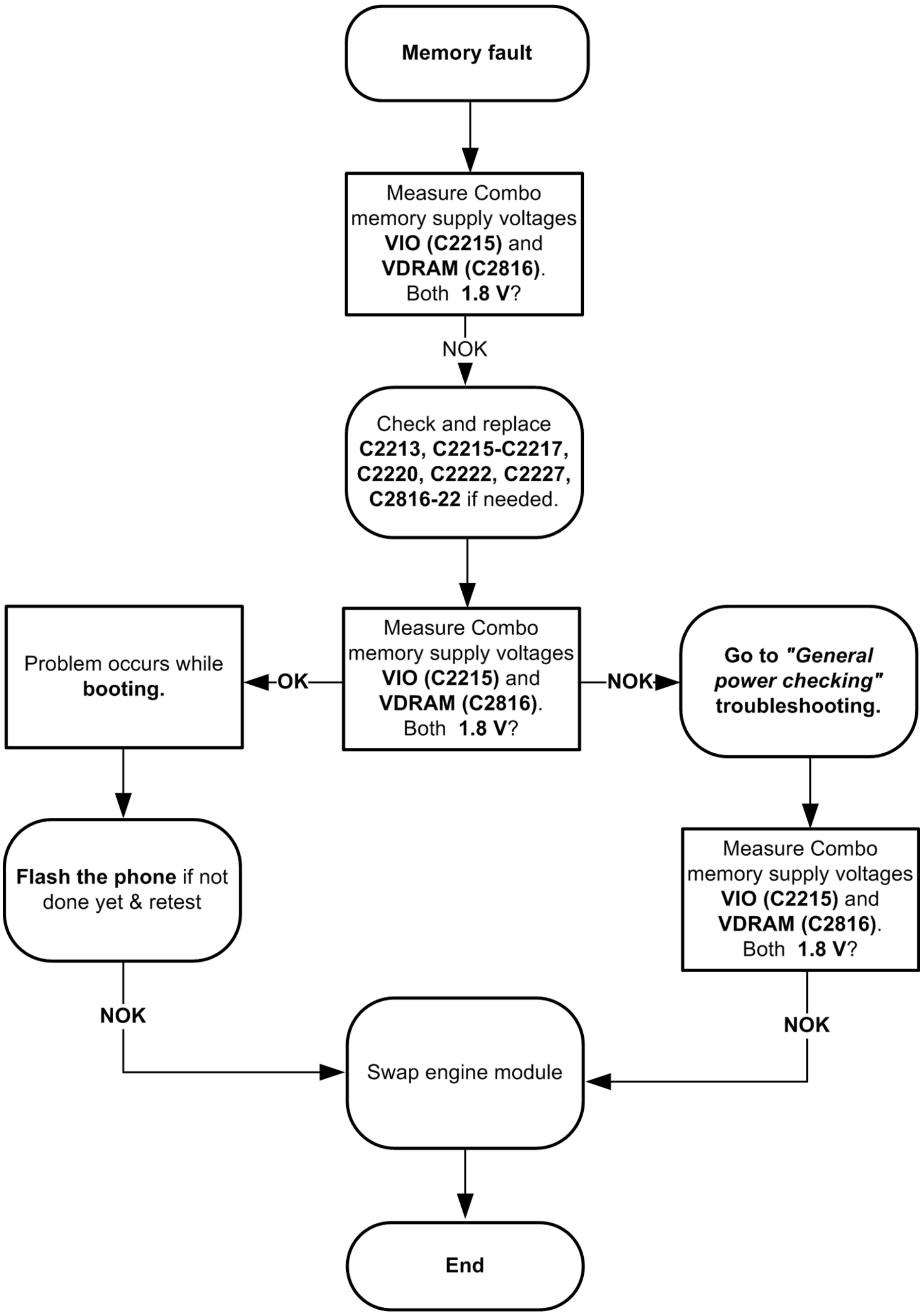
Acquisition is stopped.
2.00 GSa/s 8.20 Mpts

File
Control
Setup
Measure
Analyze
Utilities
Help
1:24 P
On
1.00 V/
On
1.00 V/
On
On
On
When flashing has started
T
BSI
PURX
More
(1of 2)
Clear
All
H
100 µs/
228.6069240 µs
T
1.040 V

Figure 9 Flashing pic 2. Take single trig measurement for the rise of the BSI signal.

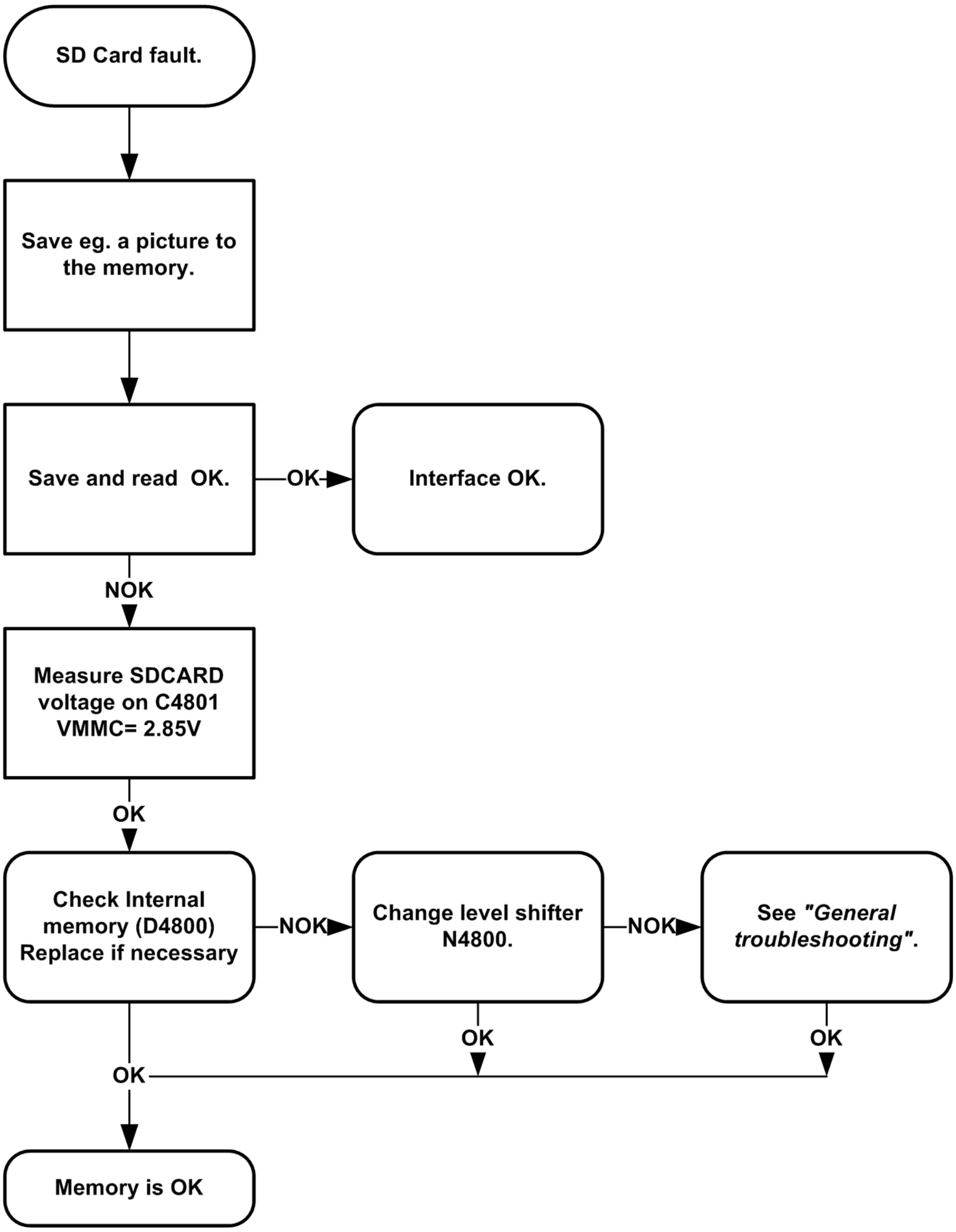
Combo memory troubleshooting

Troubleshooting flow


Memory fault
Measure Combo memory supply voltages VIO (C2215) and VDRAM (C2816). Both 1.8 V?
NOK
Check and replace C2213, C2215-C2217, C2220, C2222, C2227, C2816-22 if needed.
Measure Combo memory supply voltages VIO (C2215) and VDRAM (C2816). Both 1.8 V?
OK
Problem occurs while booting.
NOK
Go to "General power checking" troubleshooting.
Flash the phone if not done yet & retest
Measure Combo memory supply voltages VIO (C2215) and VDRAM (C2816). Both 1.8 V?
NOK
Swap engine module
NOK
End

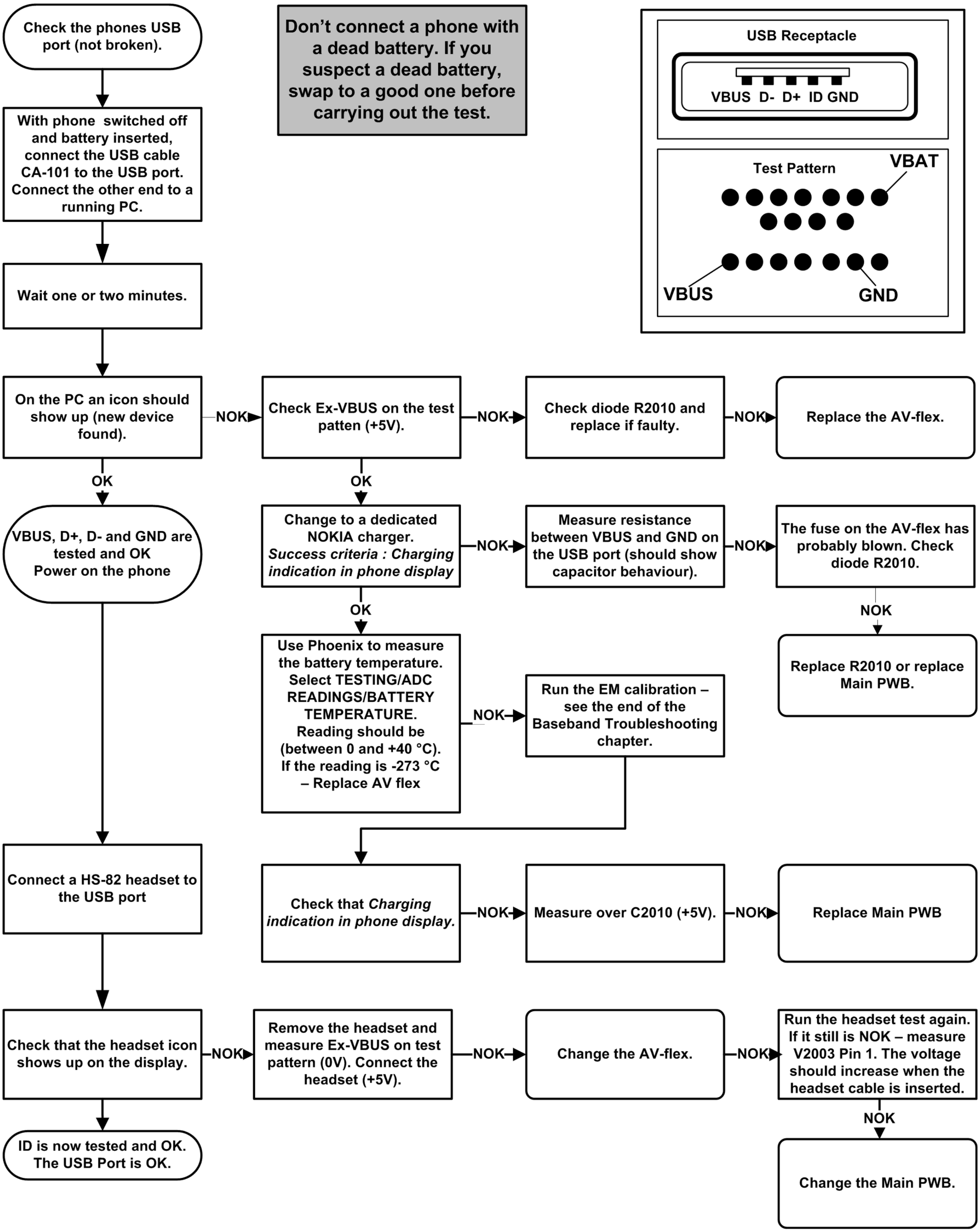
Internal memory troubleshooting

Troubleshooting flow


SD Card fault.
Save eg. a picture to the memory.
Save and read OK.
OK
Interface OK.
NOK
Measure SDCARD voltage on C4801 VMMC= 2.85V
OK
Check Internal memory (D4800) Replace if necessary
NOK
Change level shifter N4800.
NOK
See *"General troubleshooting"*.
OK
OK
OK
Memory is OK

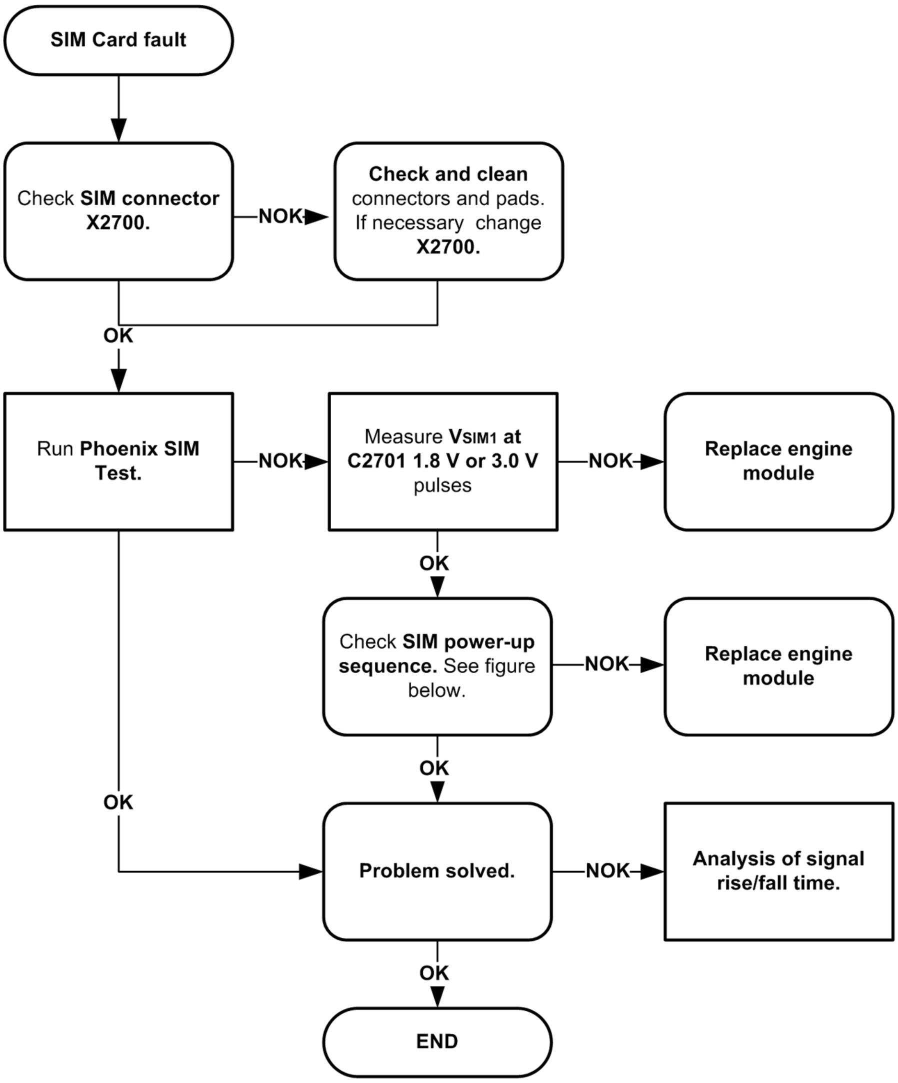
USB interface troubleshooting

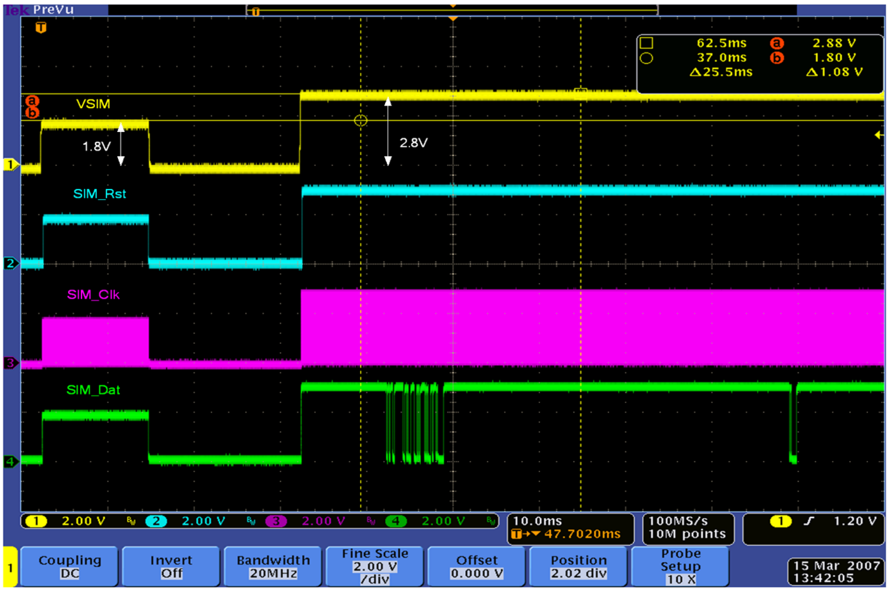
Troubleshooting flow


Check the phones USB port (not broken).
With phone switched off and battery inserted, connect the USB cable CA-101 to the USB port. Connect the other end to a running PC.
Wait one or two minutes.
Don't connect a phone with a dead battery. If you suspect a dead battery, swap to a good one before carrying out the test.
USB Receptacle
VBUS D- D+ ID GND
Test Pattern
VBAT
VBUS
GND
On the PC an icon should show up (new device found).
NOK
Check Ex-VBUS on the test patten (+5V).
NOK
Check diode R2010 and replace if faulty.
NOK
Replace the AV-flex.
OK
VBUS, D+, D- and GND are tested and OK Power on the phone
OK
Change to a dedicated NOKIA charger. *Success criteria : Charging indication in phone display*
NOK
Measure resistance between VBUS and GND on the USB port (should show capacitor behaviour).
NOK
The fuse on the AV-flex has probably blown. Check diode R2010.
NOK
Replace R2010 or replace Main PWB.
OK
Use Phoenix to measure the battery temperature. Select TESTING/ADC READINGS/BATTERY TEMPERATURE. Reading should be (between 0 and +40 °C). If the reading is -273 °C – Replace AV flex
NOK
Run the EM calibration – see the end of the Baseband Troubleshooting chapter.
Connect a HS-82 headset to the USB port
Check that *Charging indication in phone display.*
NOK
Measure over C2010 (+5V).
NOK
Replace Main PWB
Check that the headset icon shows up on the display.
NOK
Remove the headset and measure Ex-VBUS on test pattern (0V). Connect the headset (+5V).
NOK
Change the AV-flex.
NOK
Run the headset test again. If it still is NOK – measure V2003 Pin 1. The voltage should increase when the headset cable is inserted.
NOK
Change the Main PWB.
ID is now tested and OK. The USB Port is OK.

SIM card troubleshooting

Troubleshooting flow


SIM Card fault
Check SIM connector X2700.
NOK
Check and clean connectors and pads. If necessary change X2700.
OK
Run Phoenix SIM Test.
NOK
Measure VSIM1 at C2701 1.8 V or 3.0 V pulses
NOK
Replace engine module
OK
Check SIM power-up sequence. See figure below.
NOK
Replace engine module
OK
OK
Problem solved.
NOK
Analysis of signal rise/fall time.
OK
END


Tek PreVu
62.5ms
37.0ms
Δ25.5ms
2.88 V
1.80 V
Δ1.08 V
VSIM
1.8V
2.8V
SIM_Rst
SIM_Clk
SIM_Dat
2.00 V
2.00 V
2.00 V
2.00 V
10.0ms
47.7020ms
100MS/s
10M points
1.20 V
Coupling
DC
Invert
Off
Bandwidth
20MHz
Fine Scale
2.00 V /div
Offset
0.000 V
Position
2.02 div
Probe Setup
10 X
15 Mar 2007
13:42:05

User interface troubleshooting

Keypad troubleshooting

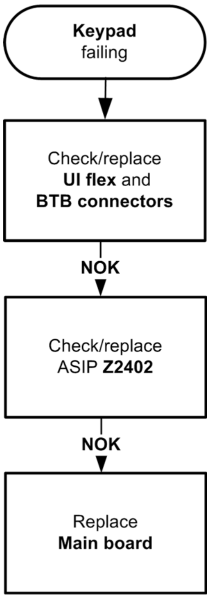
Context

There are two possible failure modes in the keyboard module:

- One or more keys are stuck, so that the key does not react when a keydome is pressed. This kind of failure is caused by mechanical reasons (dirt, rust, mechanical damage, etc.)
- Malfunction of several keys at the same time; this happens when one or more rows or columns in the key matrix are failing (shortcut or open connection).

If the failure mode is not clear, start with the Keyboard test in Phoenix.

Troubleshooting flow



Display module troubleshooting

General instructions for display troubleshooting

Context

- The display is in a normal mode when the phone is in active use.
- Display is in a partial idle mode when the phone is in the screen saver mode.
- The operating modes of the display can be controlled with the help of *Phoenix*.

Table 5 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.

Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

Table 6 Pixel defects

Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Steps

1. Verify with a working display that the fault is not on the display module itself.

   The display module cannot be repaired.
2. Check that the cellular engine is working normally.
   - i To check the functionality, connect the phone to a docking station.
   - ii Start *Phoenix* service software.
   - iii Read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).
3. Proceed to the display troubleshooting flowcharts.

   Use the **Display Test** tool in *Phoenix* to find the detailed fault mode.

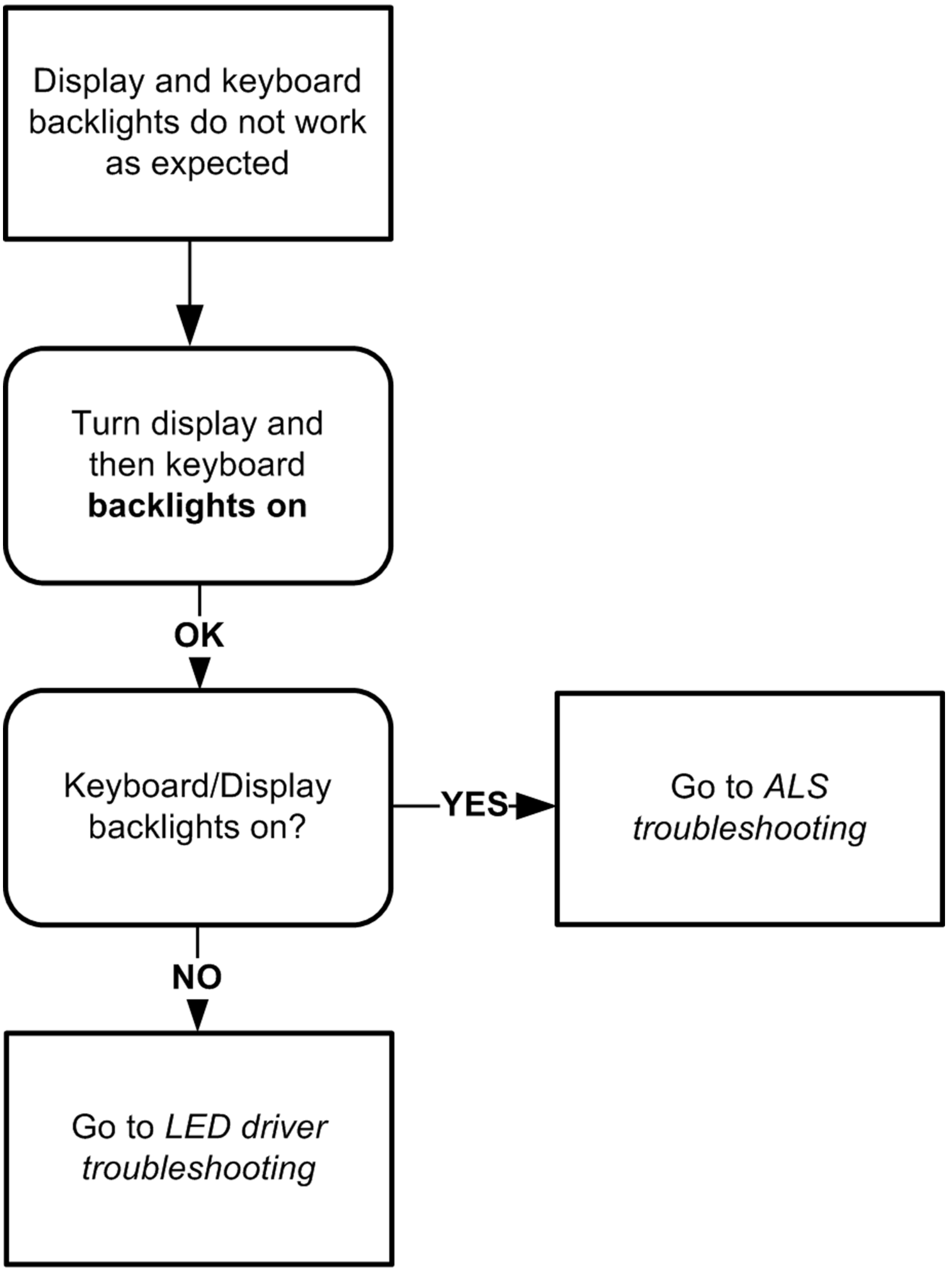
Display troubleshooting

Context

There are three different display fault cases;

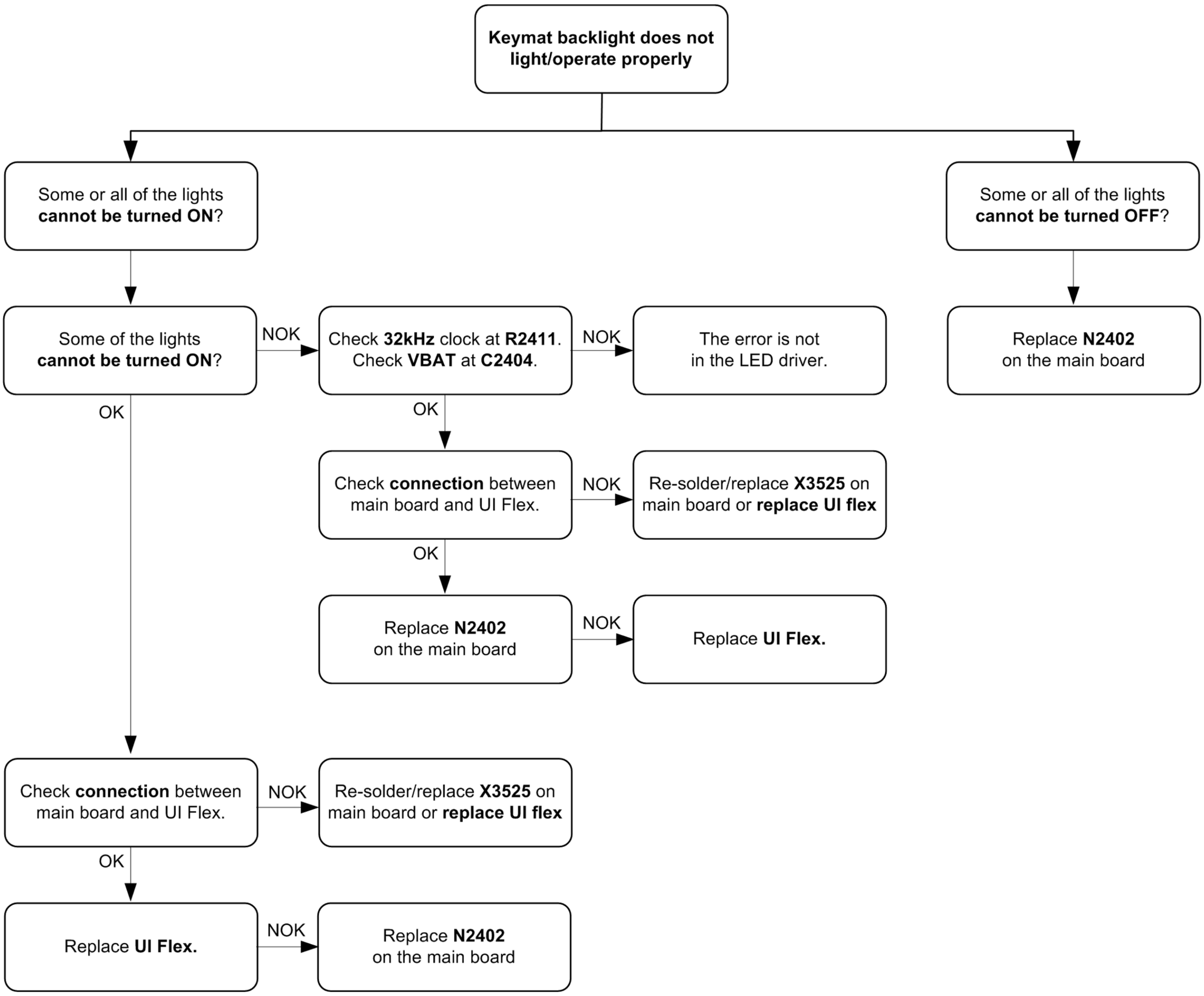
1 No backlights when image is on
2 No image when backlight is on
3 No backlight and no image

Troubleshooting flow


Display and keyboard backlights do not work as expected
Turn display and then keyboard **backlights on**
OK
Keyboard/Display backlights on?
YES
Go to *ALS troubleshooting*
NO
Go to *LED driver troubleshooting*

Keyboard backlight troubleshooting

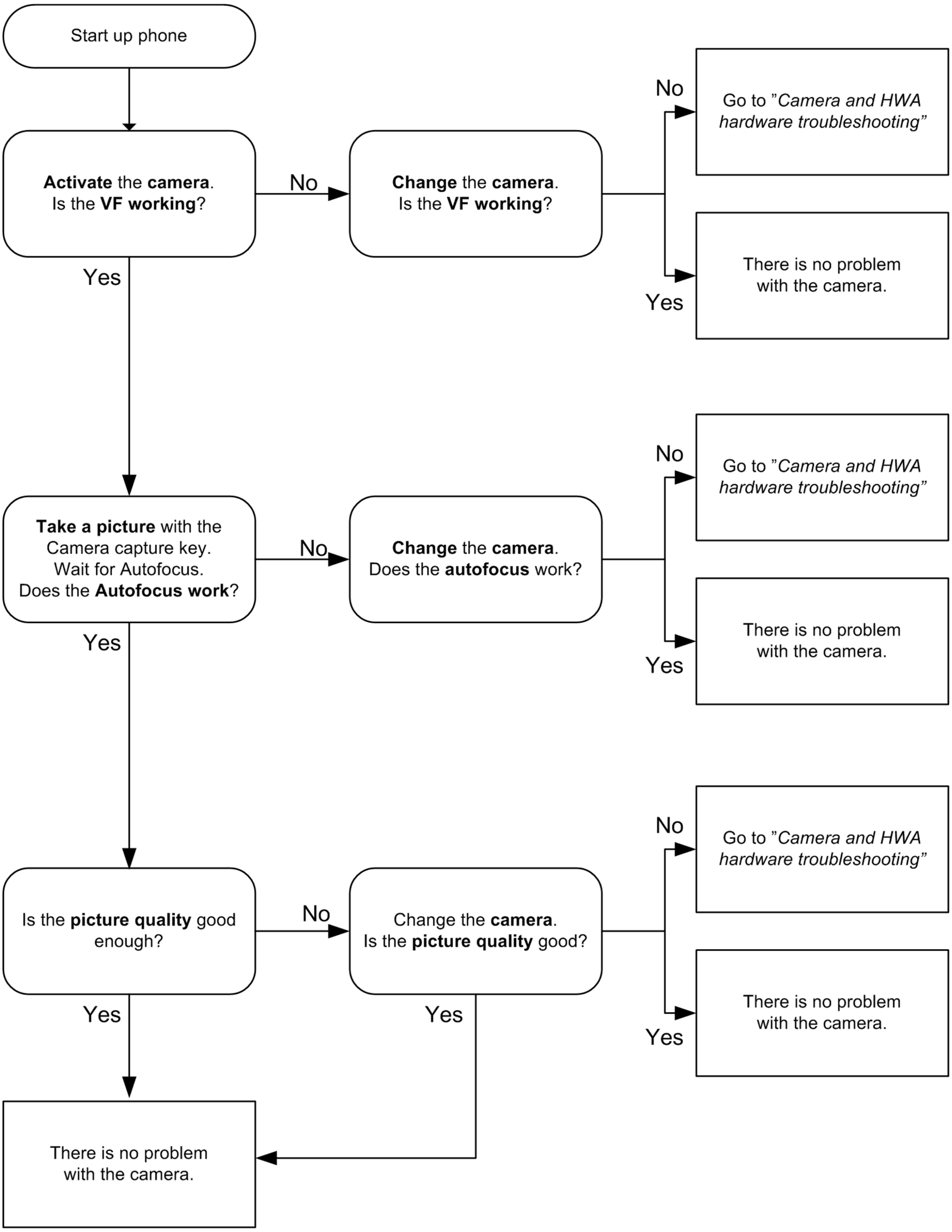
Troubleshooting flow


Keymat backlight does not light/operate properly
Some or all of the lights cannot be turned ON?
Some or all of the lights cannot be turned OFF?
Some of the lights cannot be turned ON?
NOK
Check 32kHz clock at R2411. Check VBAT at C2404.
NOK
The error is not in the LED driver.
Replace N2402 on the main board
OK
OK
Check connection between main board and UI Flex.
NOK
Re-solder/replace X3525 on main board or replace UI flex
OK
Replace N2402 on the main board
NOK
Replace UI Flex.
Check connection between main board and UI Flex.
NOK
Re-solder/replace X3525 on main board or replace UI flex
OK
Replace UI Flex.
NOK
Replace N2402 on the main board

Camera and LED flash troubleshooting

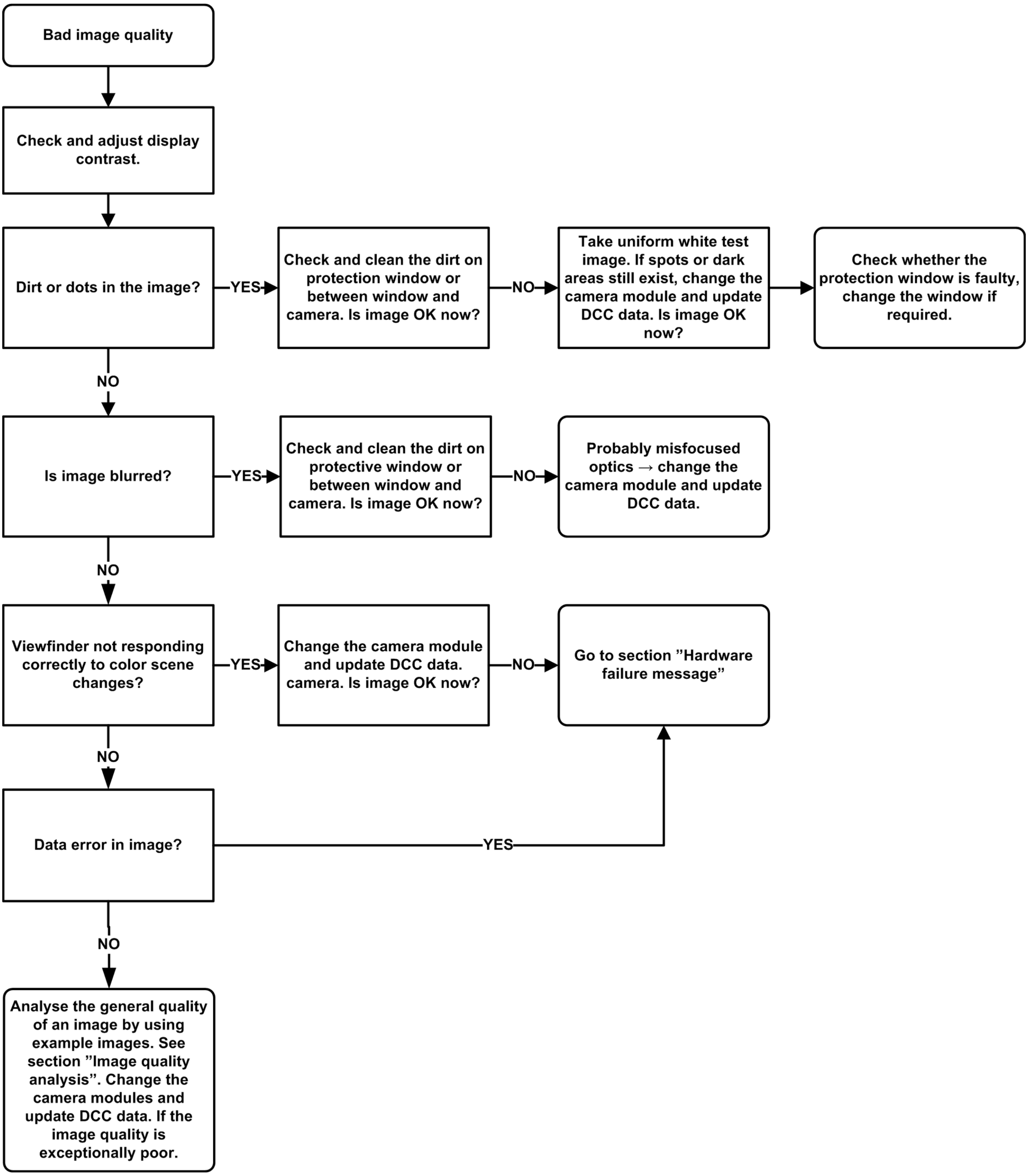
Camera troubleshooting

Troubleshooting flow


Start up phone
Activate the camera. Is the VF working?
No
Change the camera. Is the VF working?
No
Go to "Camera and HWA hardware troubleshooting"
Yes
There is no problem with the camera.
Yes
Take a picture with the Camera capture key. Wait for Autofocus. Does the Autofocus work?
No
Change the camera. Does the autofocus work?
No
Go to "Camera and HWA hardware troubleshooting"
Yes
There is no problem with the camera.
Yes
Is the picture quality good enough?
No
Change the camera. Is the picture quality good?
No
Go to "Camera and HWA hardware troubleshooting"
Yes
There is no problem with the camera.
Yes
Yes
There is no problem with the camera.

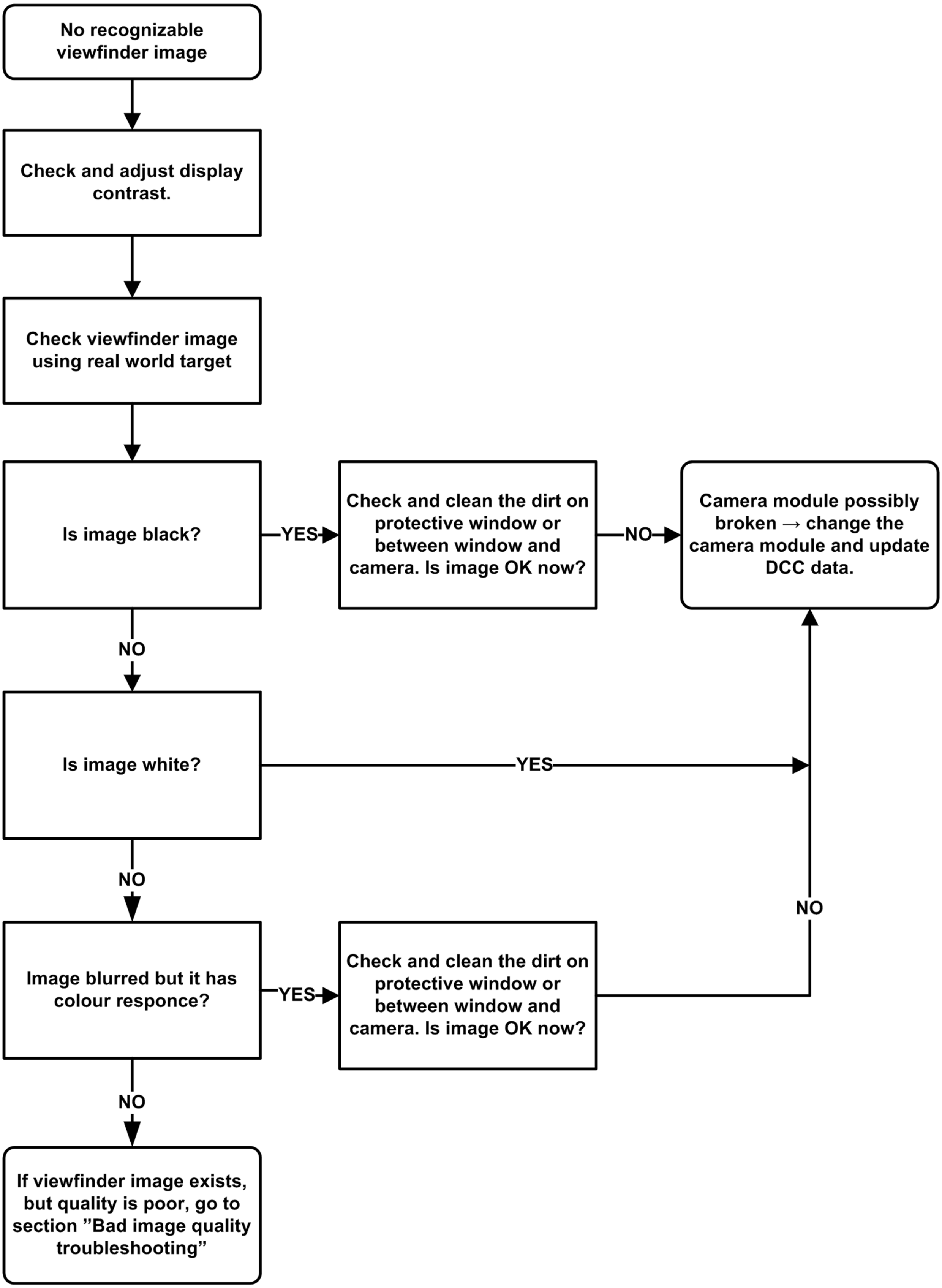
Bad camera image quality troubleshooting

Troubleshooting flow


Bad image quality
Check and adjust display contrast.
Dirt or dots in the image?
YES
Check and clean the dirt on protection window or between window and camera. Is image OK now?
NO
Take uniform white test image. If spots or dark areas still exist, change the camera module and update DCC data. Is image OK now?
Check whether the protection window is faulty, change the window if required.
NO
Is image blurred?
YES
Check and clean the dirt on protective window or between window and camera. Is image OK now?
NO
Probably misfocused optics → change the camera module and update DCC data.
NO
Viewfinder not responding correctly to color scene changes?
YES
Change the camera module and update DCC data. camera. Is image OK now?
NO
Go to section ”Hardware failure message”
NO
Data error in image?
YES
NO
Analyse the general quality of an image by using example images. See section ”Image quality analysis”. Change the camera modules and update DCC data. If the image quality is exceptionally poor.

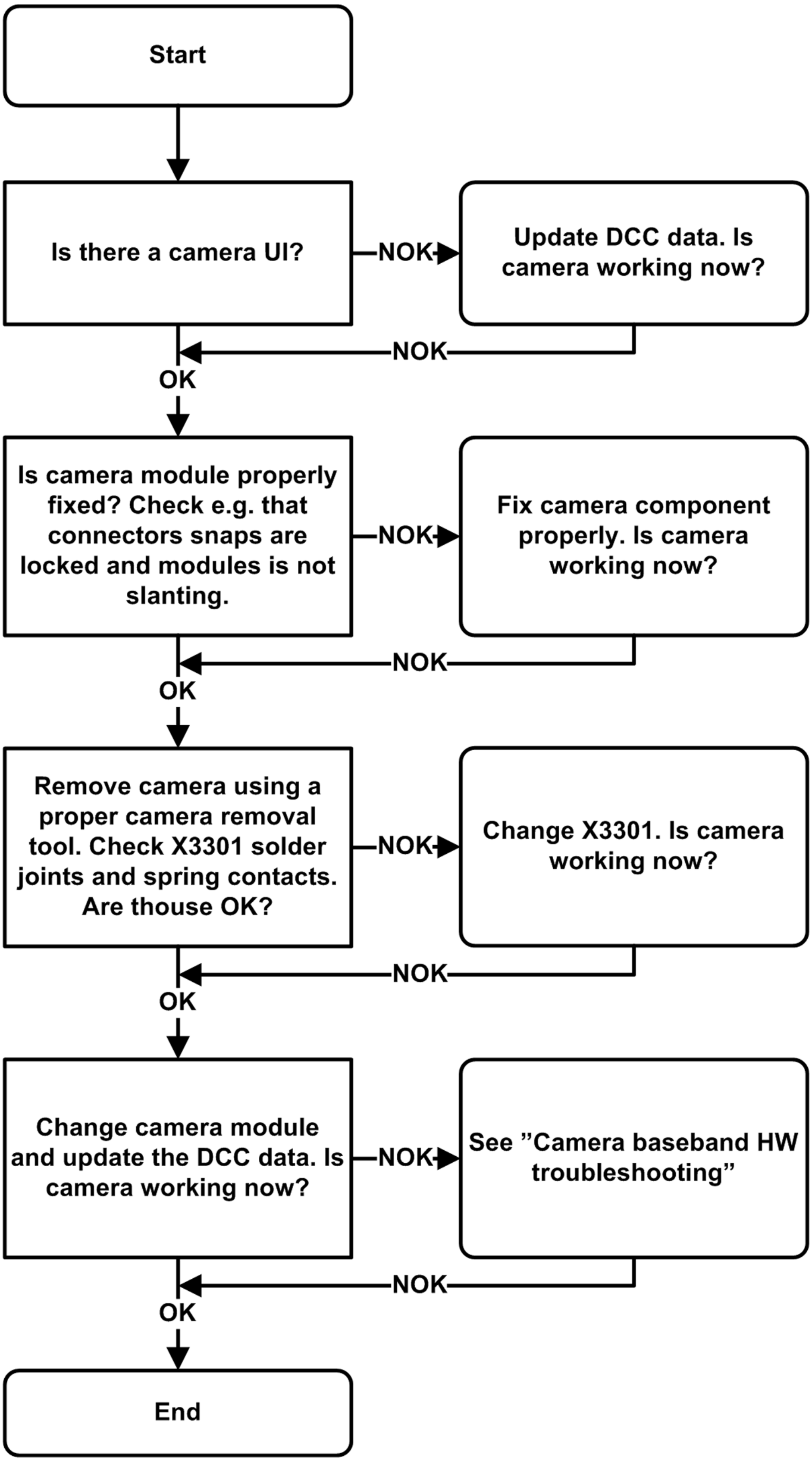
Camera viewfinder troubleshooting

Troubleshooting flow


No recognizable viewfinder image
Check and adjust display contrast.
Check viewfinder image using real world target
Is image black?
YES
Check and clean the dirt on protective window or between window and camera. Is image OK now?
NO
Camera module possibly broken → change the camera module and update DCC data.
NO
Is image white?
YES
NO
Image blurred but it has colour responce?
YES
Check and clean the dirt on protective window or between window and camera. Is image OK now?
NO
NO
If viewfinder image exists, but quality is poor, go to section ”Bad image quality troubleshooting”

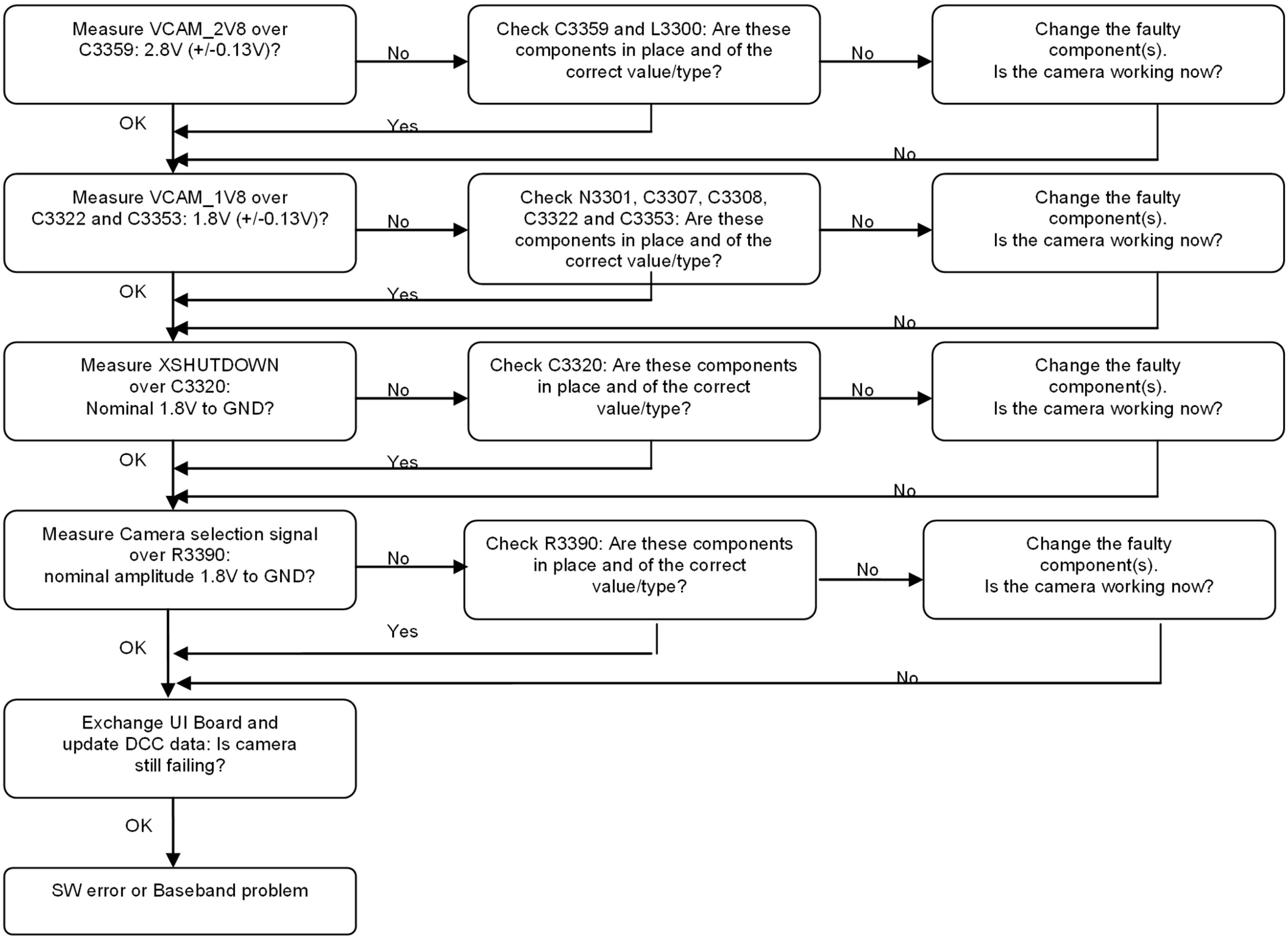
Camera hardware failure message troubleshooting

Troubleshooting flow


Start
Is there a camera UI?
NOK
Update DCC data. Is camera working now?
NOK
OK
Is camera module properly fixed? Check e.g. that connectors snaps are locked and modules is not slanting.
NOK
Fix camera component properly. Is camera working now?
NOK
OK
Remove camera using a proper camera removal tool. Check X3301 solder joints and spring contacts. Are thouse OK?
NOK
Change X3301. Is camera working now?
NOK
OK
Change camera module and update the DCC data. Is camera working now?
NOK
See ”Camera baseband HW troubleshooting”
NOK
OK
End

Camera hardware troubleshooting

Troubleshooting flow

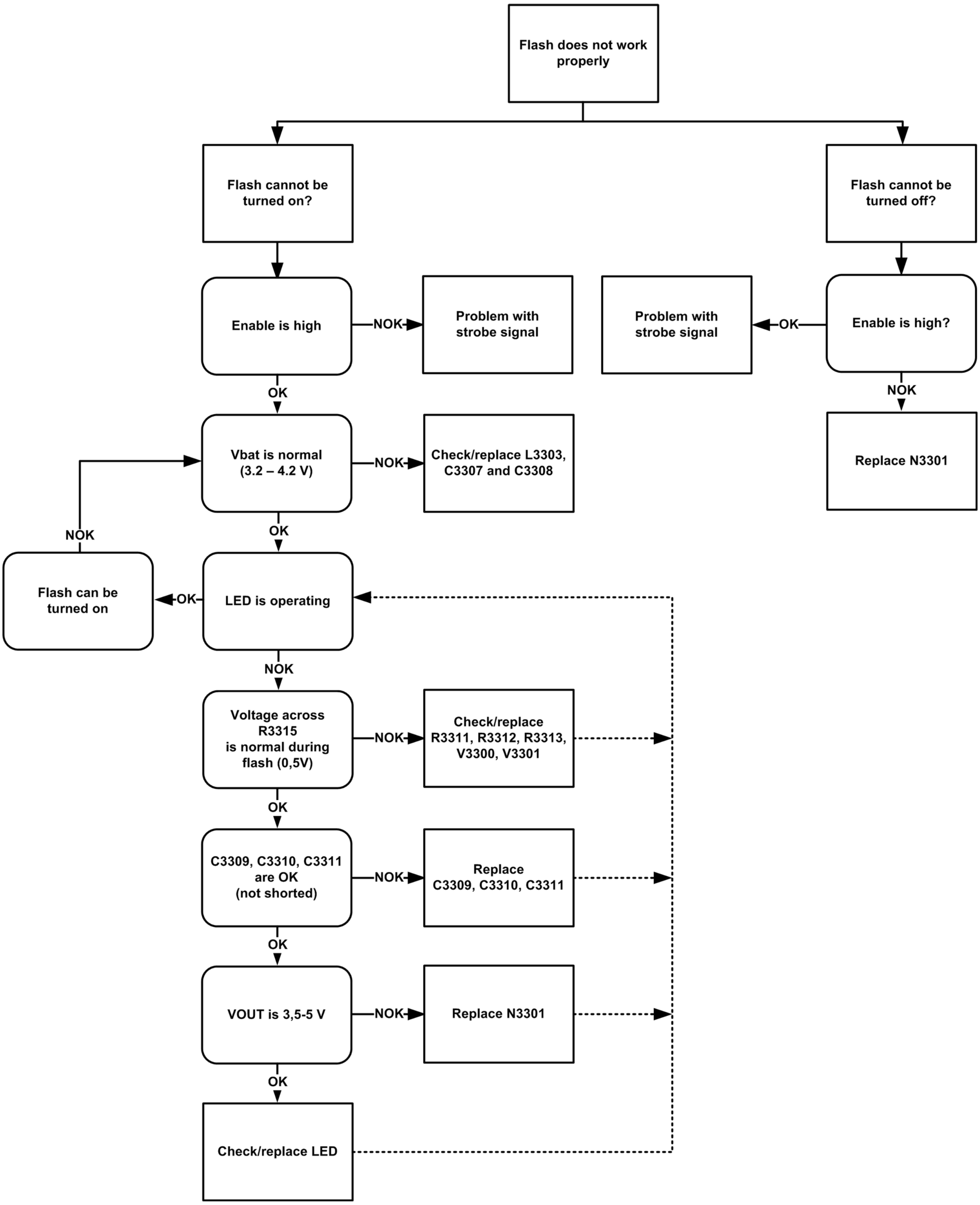

Measure VCAM_2V8 over C3359: 2.8V (+/-0.13V)?
No
Check C3359 and L3300: Are these components in place and of the correct value/type?
No
Change the faulty component(s). Is the camera working now?
OK
Yes
No
Measure VCAM_1V8 over C3322 and C3353: 1.8V (+/-0.13V)?
No
Check N3301, C3307, C3308, C3322 and C3353: Are these components in place and of the correct value/type?
No
Change the faulty component(s). Is the camera working now?
OK
Yes
No
Measure XSHUTDOWN over C3320: Nominal 1.8V to GND?
No
Check C3320: Are these components in place and of the correct value/type?
No
Change the faulty component(s). Is the camera working now?
OK
Yes
No
Measure Camera selection signal over R3390: nominal amplitude 1.8V to GND?
No
Check R3390: Are these components in place and of the correct value/type?
No
Change the faulty component(s). Is the camera working now?
Yes
OK
No
Exchange UI Board and update DCC data: Is camera still failing?
OK
SW error or Baseband problem

LED camera flash troubleshooting

Context

Note: There are three different flash modes.

Troubleshooting flow


Flash does not work properly
Flash cannot be turned on?
Flash cannot be turned off?
Enable is high
NOK
Problem with strobe signal
Problem with strobe signal
OK
Enable is high?
NOK
Replace N3301
OK
Vbat is normal (3.2 – 4.2 V)
NOK
Check/replace L3303, C3307 and C3308
NOK
OK
Flash can be turned on
OK
LED is operating
NOK
Voltage across R3315 is normal during flash (0,5V)
NOK
Check/replace R3311, R3312, R3313, V3300, V3301
OK
C3309, C3310, C3311 are OK (not shorted)
NOK
Replace C3309, C3310, C3311
OK
VOUT is 3,5-5 V
NOK
Replace N3301
OK
Check/replace LED

Audio troubleshooting

Audio troubleshooting test instructions

Differential external earpiece and internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- 'Active speaker' or 'speaker and power amplifier'
- Sound level meter
- Current probe (Internal handsfree DPMA output measurement)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Internal microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	XMICP and GND	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	XMICN and GND	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	-4.5	1000	600	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	B2102 pads	-5	1000	560	0	25mA (calc.)
	XMICN and GND	B2102 pads					
Internal Mic to External Earpiece	B2100 (OUT/GND)	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

Measurement data

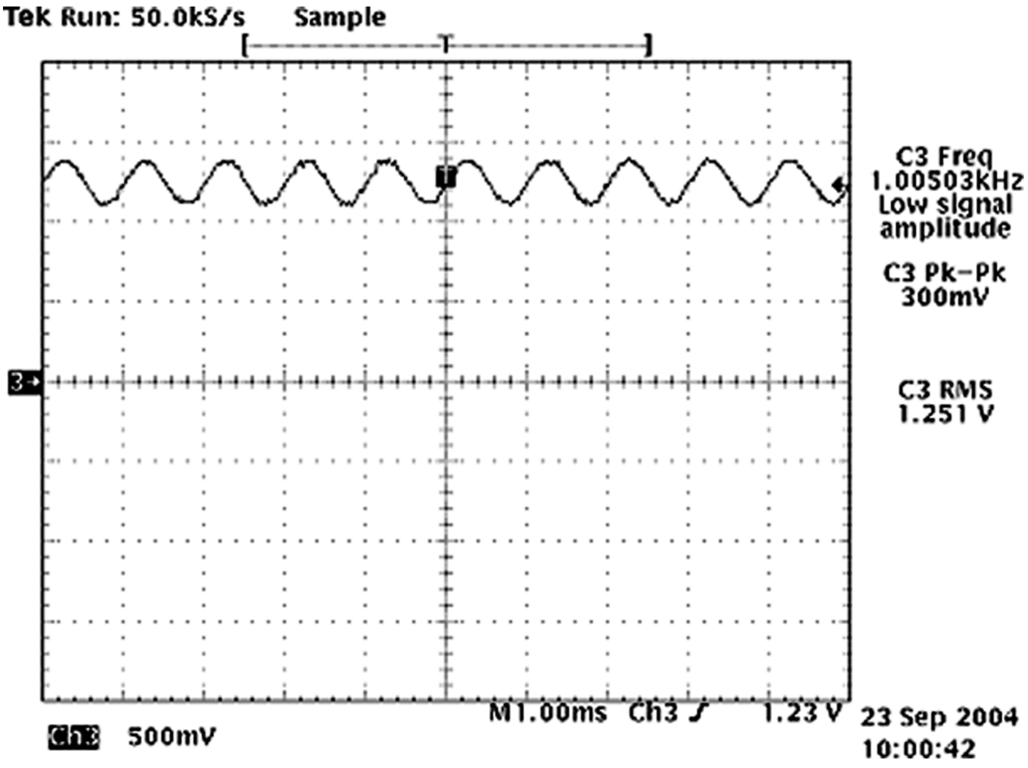
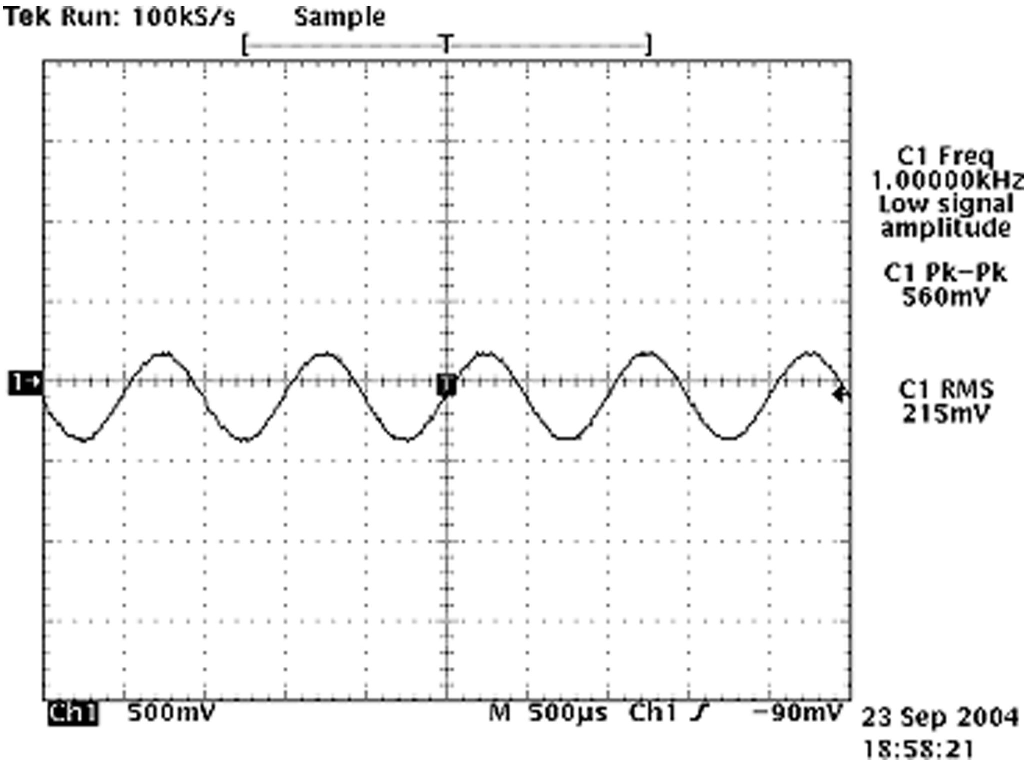


Figure 10 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

Figure 11 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

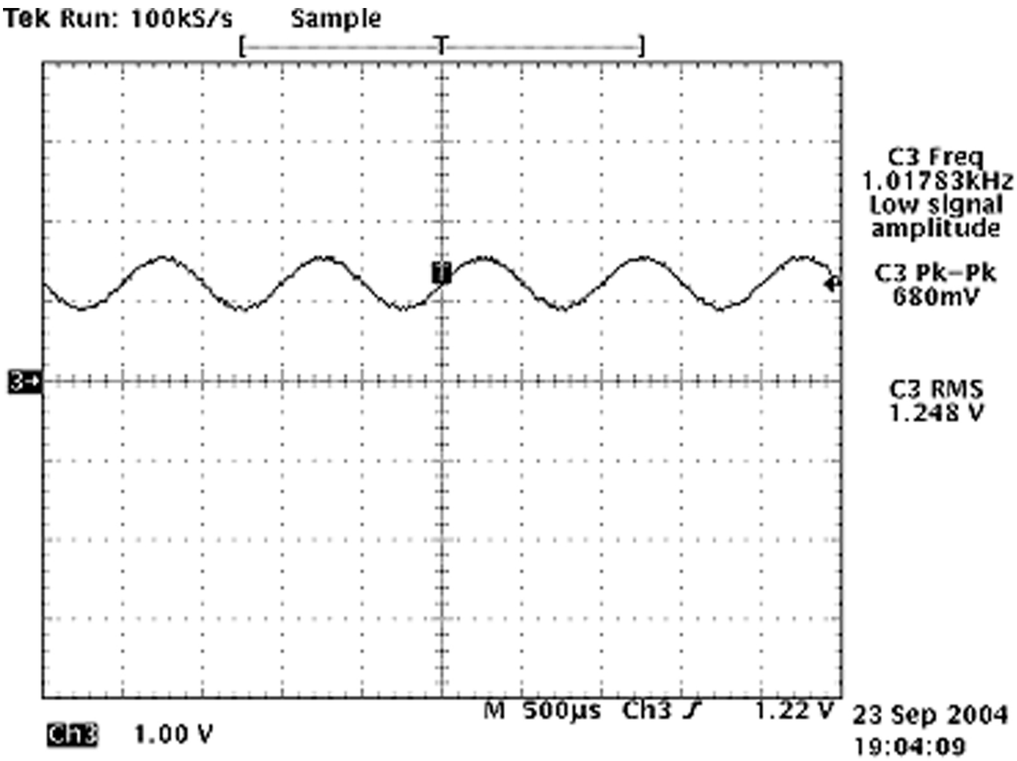
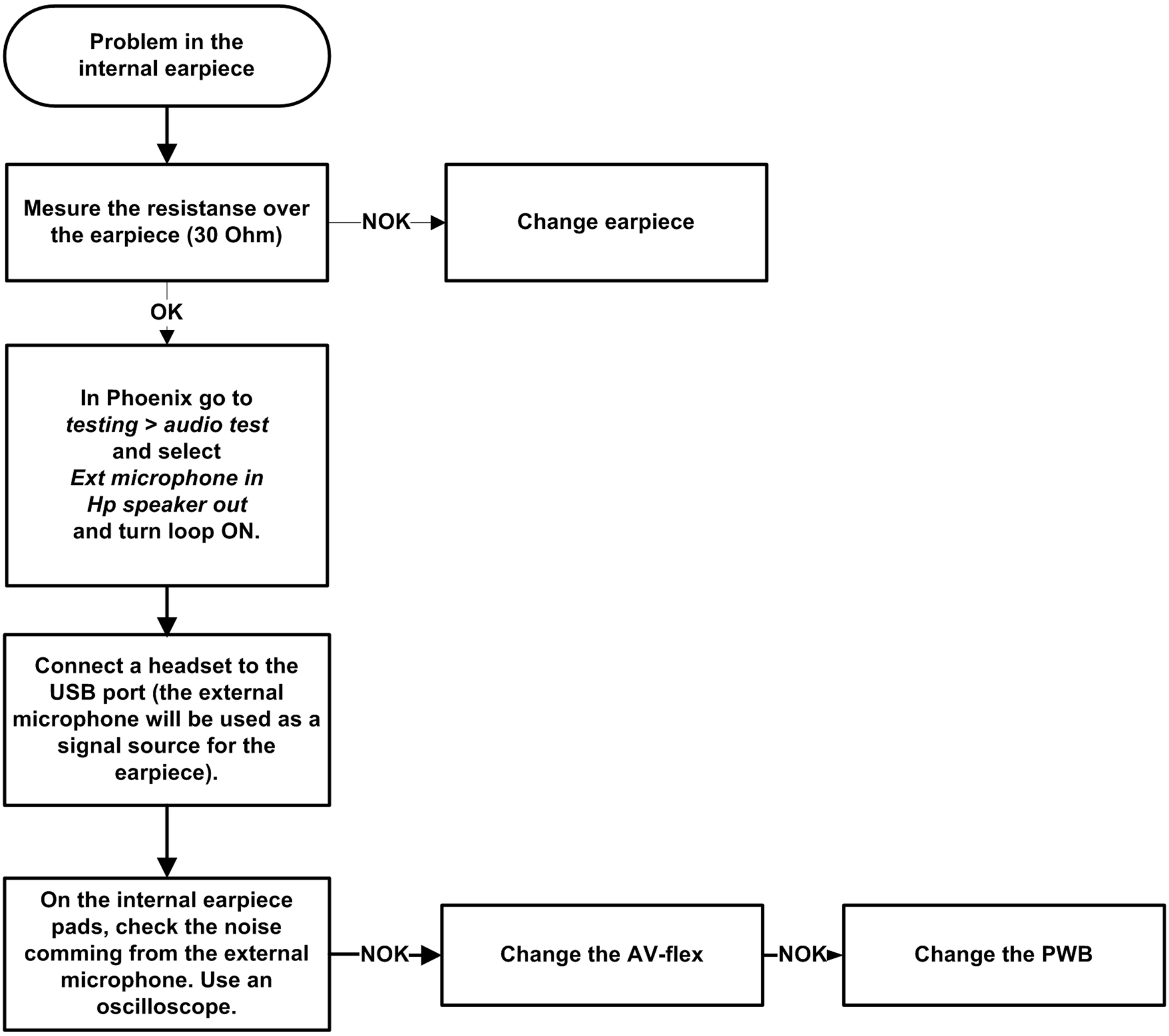

Tek Run: 100kS/s
Sample
C3 Freq
1.01783kHz
Low signal
amplitude
C3 Pk-Pk
680mV
C3 RMS
1.248 V
3→
Ch3 1.00 V
M 500µs Ch3 ƒ 1.22 V
23 Sep 2004
19:04:09

Figure 12 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

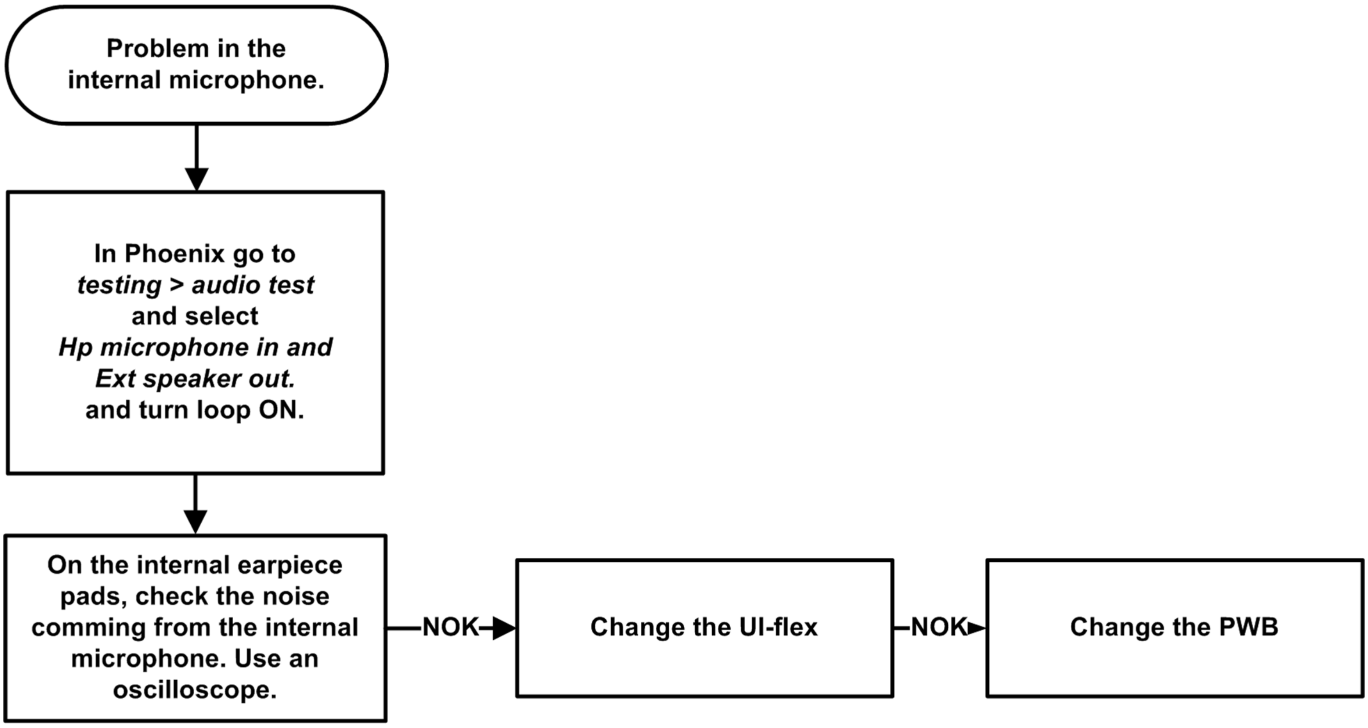
Internal earpiece troubleshooting

Troubleshooting flow


Problem in the internal earpiece
Mesure the resistanse over the earpiece (30 Ohm)
NOK
Change earpiece
OK
In Phoenix go to *testing > audio test* and select *Ext microphone in* *Hp speaker out* and turn loop ON.
Connect a headset to the USB port (the external microphone will be used as a signal source for the earpiece).
On the internal earpiece pads, check the noise comming from the external microphone. Use an oscilloscope.
NOK
Change the AV-flex
NOK
Change the PWB

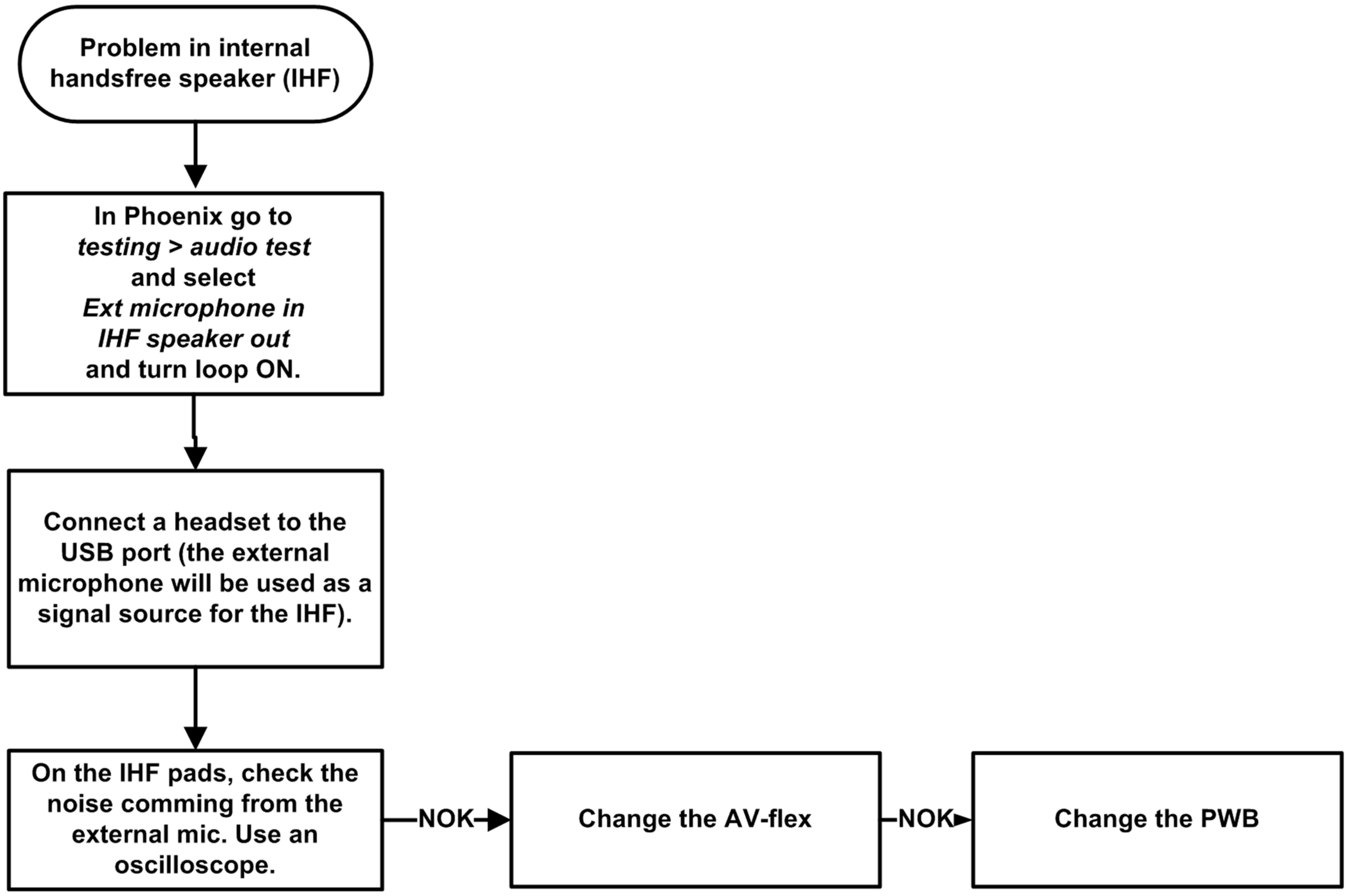
Internal microphone troubleshooting

Troubleshooting flow


Problem in the internal microphone.
In Phoenix go to *testing > audio test* and select *Hp microphone in and Ext speaker out.* and turn loop ON.
On the internal earpiece pads, check the noise comming from the internal microphone. Use an oscilloscope.
NOK
Change the UI-flex
NOK
Change the PWB

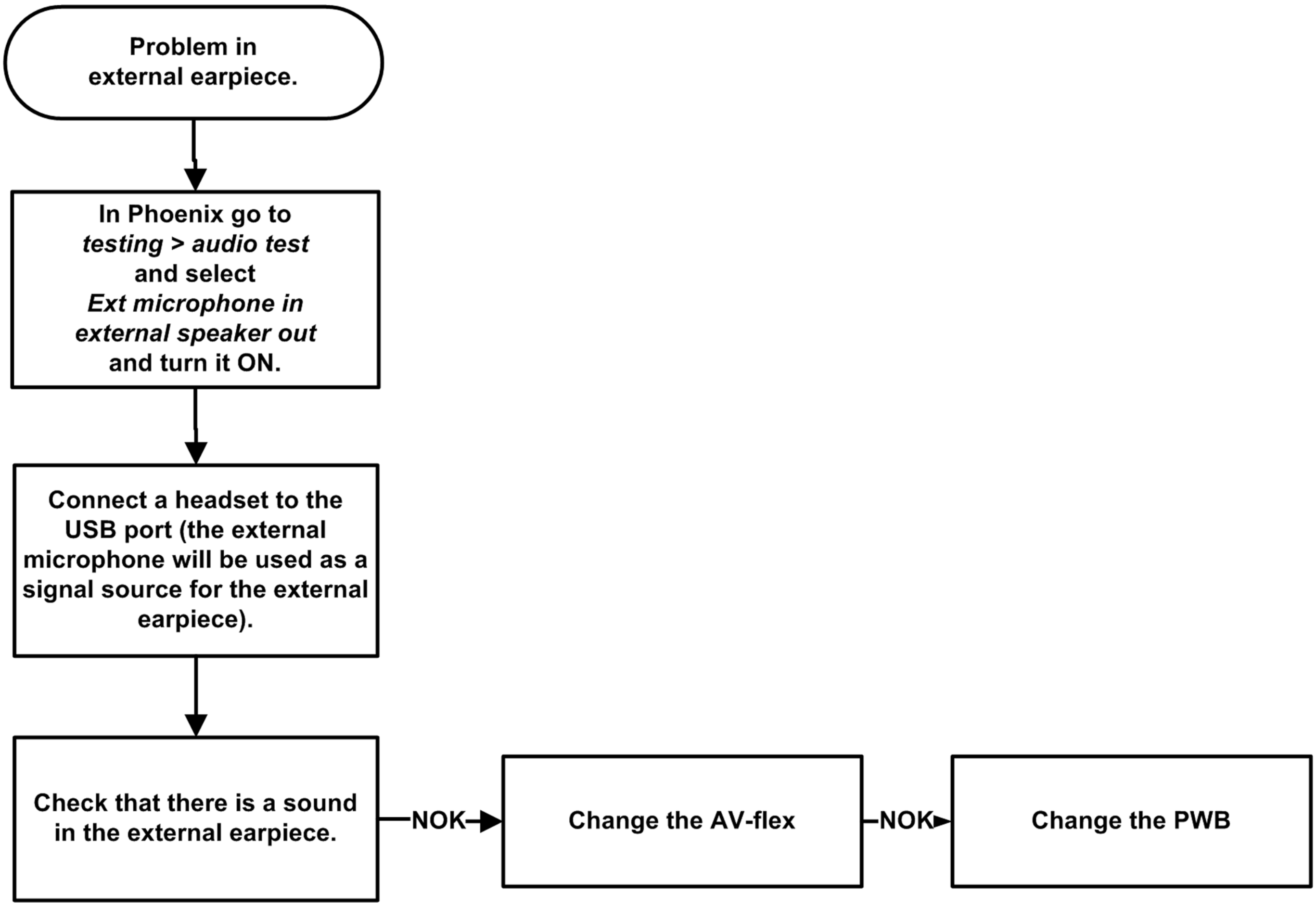
Internal handsfree (IHF) troubleshooting

Troubleshooting flow


Problem in internal handsfree speaker (IHF)
In Phoenix go to *testing > audio test* and select *Ext microphone in IHF speaker out* and turn loop ON.
Connect a headset to the USB port (the external microphone will be used as a signal source for the IHF).
On the IHF pads, check the noise comming from the external mic. Use an oscilloscope.
NOK
Change the AV-flex
NOK
Change the PWB

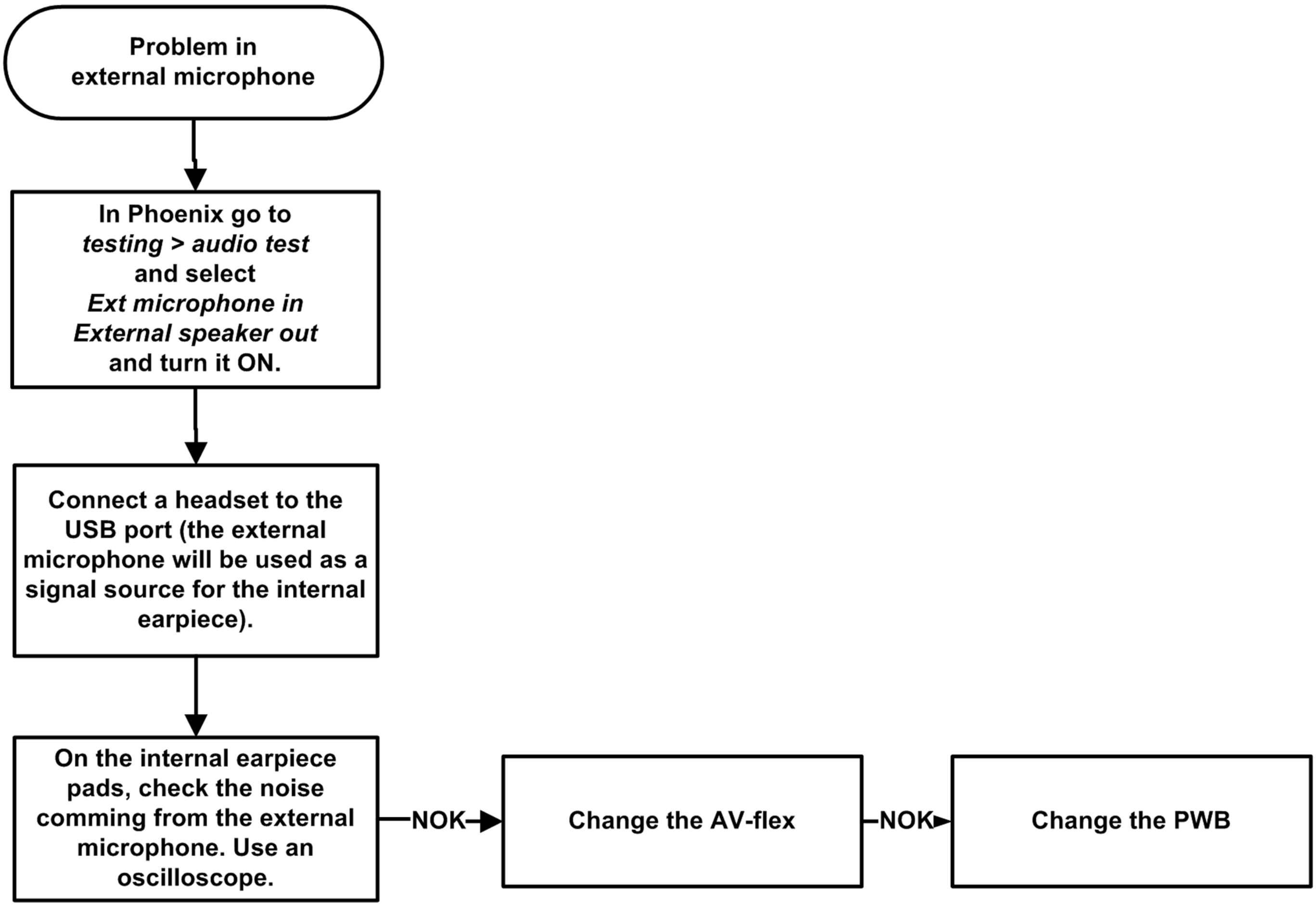
External earpiece troubleshooting

Troubleshooting flow


Problem in external earpiece.
In Phoenix go to *testing > audio test* and select *Ext microphone in external speaker out* and turn it ON.
Connect a headset to the USB port (the external microphone will be used as a signal source for the external earpiece).
Check that there is a sound in the external earpiece.
NOK
Change the AV-flex
NOK
Change the PWB

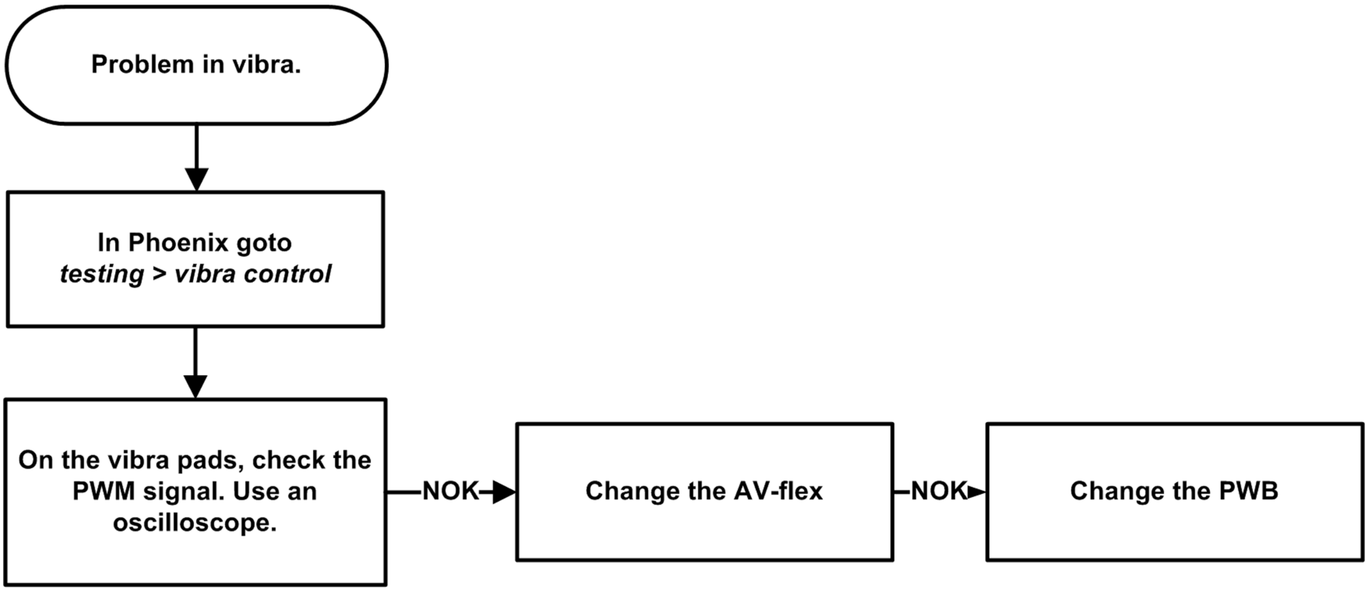
External microphone troubleshooting

Troubleshooting flow


Problem in external microphone
In Phoenix go to *testing > audio test* and select *Ext microphone in External speaker out* and turn it ON.
Connect a headset to the USB port (the external microphone will be used as a signal source for the internal earpiece).
On the internal earpiece pads, check the noise comming from the external microphone. Use an oscilloscope.
NOK
Change the AV-flex
NOK
Change the PWB

Vibra troubleshooting

Troubleshooting flow


Problem in vibra.
In Phoenix goto *testing > vibra control*
On the vibra pads, check the PWM signal. Use an oscilloscope.
NOK
Change the AV-flex
NOK
Change the PWB

Baseband manual tuning guide

Certificate restoring for BB5 products

Context

This procedure is performed when the device certificate is corrupted for some reason.

All tunings (RF & Baseband, UI) must be done after performing the certificate restoring procedure.

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FPS-8 or FPS-10.

  Note: USB flashing does not work for a dead BB5 phone.
- Create a request file.
- Send the file to Nokia by e-mail. Use the following addresses depending on your location:
  - APAC: sydney.service@nokia.com
  - CHINA: repair.ams@nokia.com
  - E&A: salo.repair@nokia.com
  - AMERICAS: fls1.usa@nokia.com
- When you receive a reply from Nokia, carry out certificate restoring.
- Tune the phone completely.

  Note: SX-4 smart card is needed.
- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- *Phoenix* service software v 2007.19 or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle

- SX-4 smart card (Enables BB5 testing and tuning features)
- External smart card reader

  Note: The smart card reader is only needed when FPS-8 is used. FPS-10 has an integrated smart card reader.
- Activated FPS-8 flash prommer **OR** FPS-10 flash prommer
- Flash update package 03.18.004 or newer for FPS-8 or FPS-10 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

  Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

Steps

1. Program the phone software.

   i Start *Phoenix* and login. Make sure the connection has been managed correctly for FPS-8 or FPS-10.

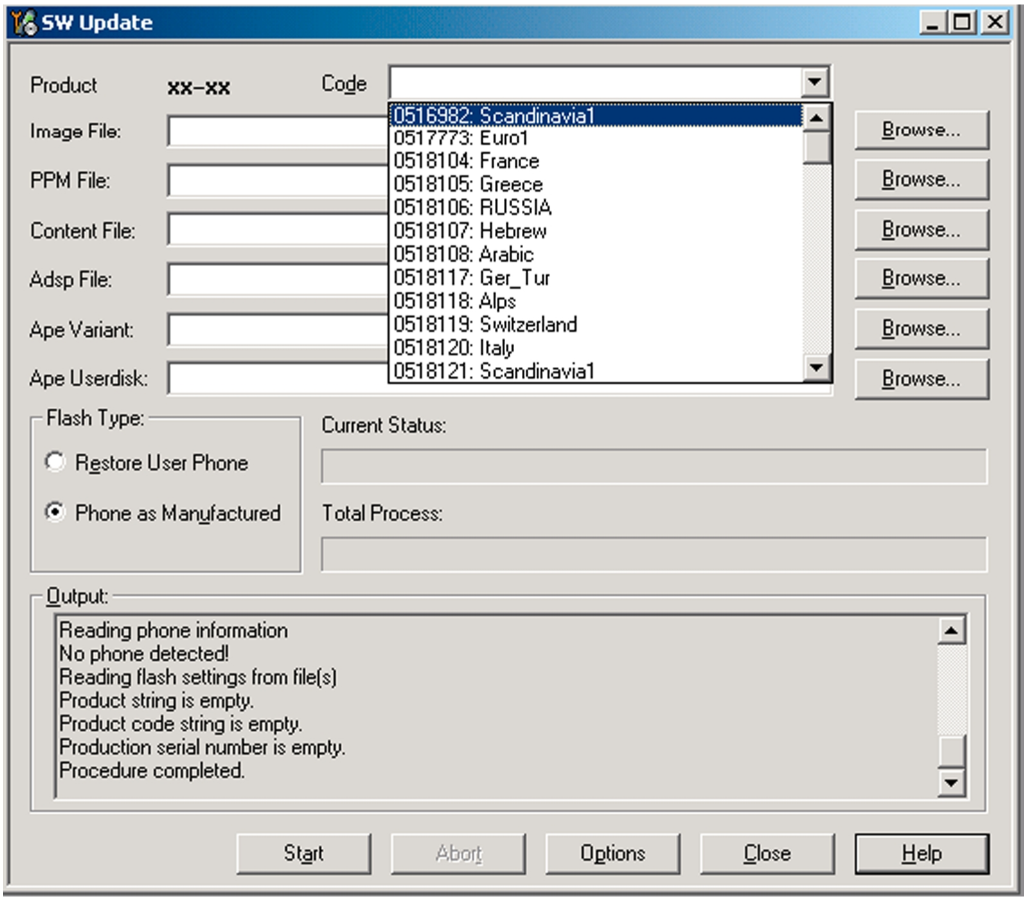
   ii Update the phone MCU software to the latest available version.

   If the new flash is empty and the phone cannot communicate with *Phoenix*, reflash the phone.

   iii Choose the product manually from **File→Open Product** , and click **OK**.

   Wait for the phone type designator (e.g. "RM-1") to be displayed in the status bar.

   iv Go to **Flashing→SW Update** and wait until *Phoenix* reads the product data as shown in the following picture.



Product xx-xx

Code

0516982: Scandinavia1
0517773: Euro1
0518104: France
0518105: Greece
0518106: RUSSIA
0518107: Hebrew
0518108: Arabic
0518117: Ger_Tur
0518118: Alps
0518119: Switzerland
0518120: Italy
0518121: Scandinavia1

Flash Type:
○ Restore User Phone
● Phone as Manufactured

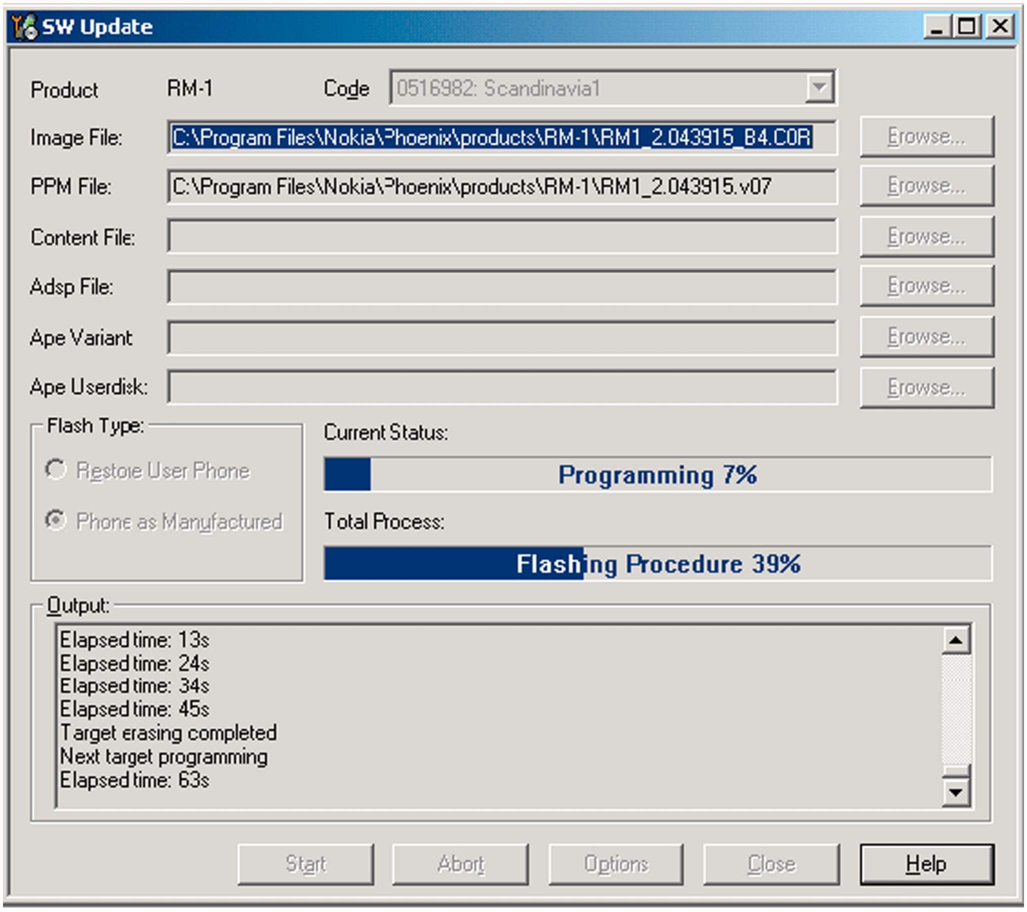
Output:

```
Reading phone information
No phone detected!
Reading flash settings from file(s)
Product string is empty.
Product code string is empty.
Production serial number is empty.
Procedure completed.
```

Product	is automatically set according to the phone support module which was opened manually, but the flash files cannot be found because the correct data cannot be read from the phone automatically.
Code	must be chosen manually, it determines the correct flash files to be used. Please choose the correct product code (can be seen in the phone type label) from the dropdown list.
Flash Type	must be set to **Phone as Manufactured**.

v To continue, click **Start**.

Progress bars and messages on the screen show actions during phone programming, please wait.



Product RM-1 Code 0516982: Scandinavia1

Image File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915_B4.C0R

PPM File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915.v07

Content File:

Adsp File:

Ape Variant

Ape Userdisk:

Flash Type:
○ Restore User Phone
● Phone as Manufactured

Current Status: Programming 7%

Total Process: Flashing Procedure 39%

Output:

```
Elapsed time: 13s
Elapsed time: 24s
Elapsed time: 34s
Elapsed time: 45s
Target erasing completed
Next target programming
Elapsed time: 63s
```

Programming is completed when *Flashing Completed* message is displayed.

The product type designator and MCU SW version are displayed in the status bar.

vi Close the *SW Update* window and then choose **File→Close Product** .

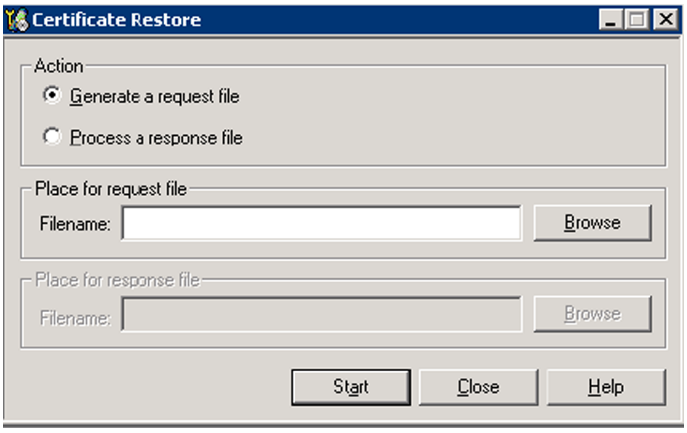
2. Create a *Request* file.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

i To connect the phone with *Phoenix*, choose **File→Scan Product** .

ii Choose **Tools→Certificate Restore** .

iii To choose a location for the request file, click **Browse**.



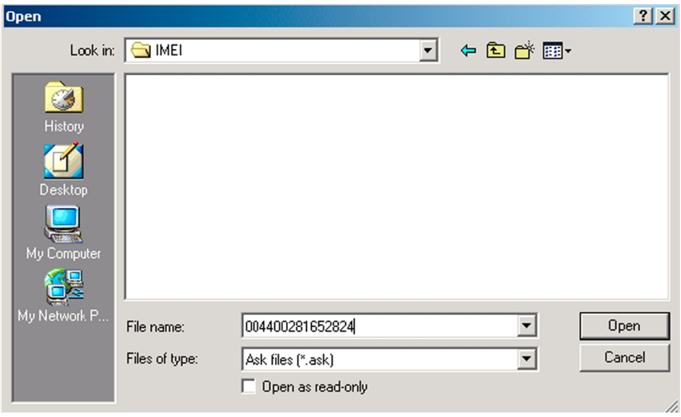
Certificate Restore

Action
● Generate a request file
○ Process a response file

Place for request file
Filename:

Browse
Place for response file
Filename:
Browse
Start
Close
Help

iv Name the file so that you can easily identify it, and click **Open**.



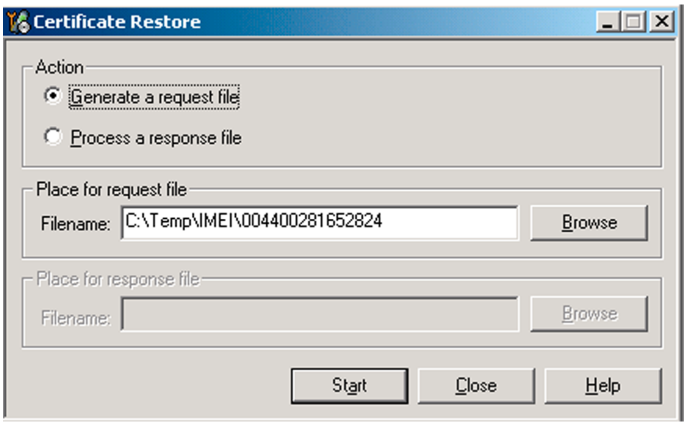
Open

Look in: IMEI

File name: 004400281652824
Files of type: Ask files (*.ask)
☐ Open as read-only

History
Desktop
My Computer
My Network P...
Open
Cancel

The name of the file and its location are shown.



Certificate Restore

Action
● Generate a request file
○ Process a response file

Place for request file
Filename: C:\Temp\IMEI\004400281652824

Browse
Place for response file
Filename:
Browse
Start
Close
Help

v To create the *Request* file, click **Start**.

vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.

3. Restore certificate.

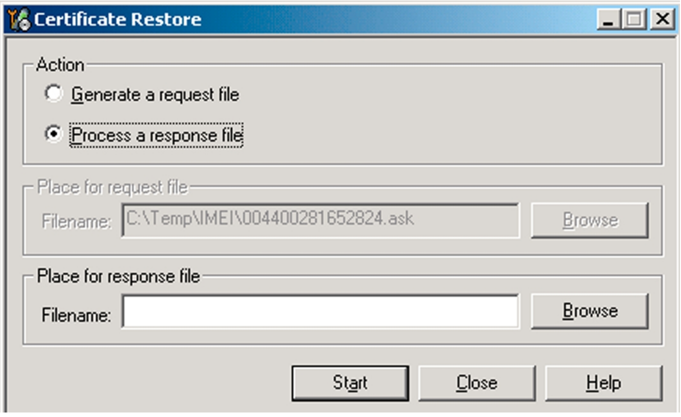
For this procedure, you must supply +12 V to CU-4 from an external power supply.

i Save the reply file sent by Nokia to your computer.

ii Start *Phoenix* service software.

iii Choose **File→Scan Product** .

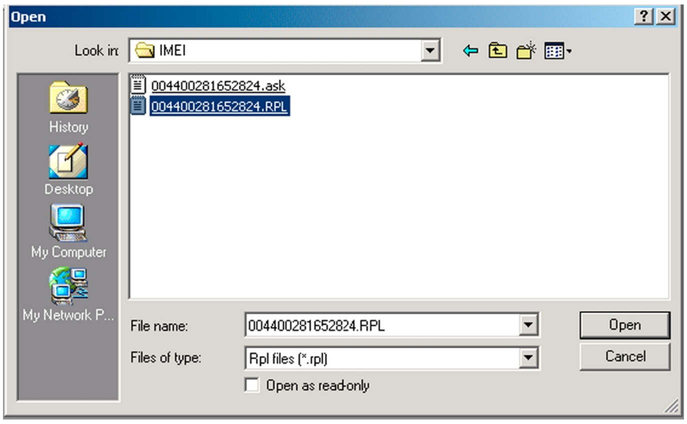
iv From the **Tools** menu, choose **Certificate Restore** and select **Process a response file** in the *Action* pane.



Certificate Restore
Action
○ Generate a request file
● Process a response file
Place for request file
Filename: C:\Temp\IMEI\004400281652824.ask
Browse
Place for response file
Filename:
Browse
Start
Close
Help

v To choose the location where response file is saved, click **Browse**.

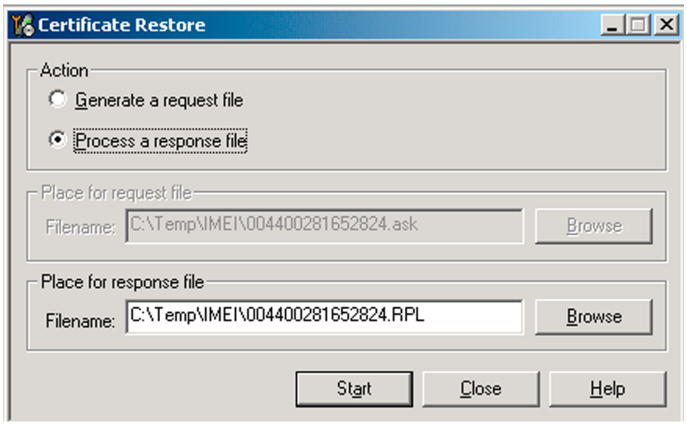
vi Click **Open**.



Open
Look in: IMEI
004400281652824.ask
004400281652824.RPL
History
Desktop
My Computer
My Network P...
File name: 004400281652824.RPL
Files of type: Rpl files (*.rpl)
☐ Open as read-only
Open
Cancel

The name of the file and the path where it is located are shown.

vii To write the file to phone, click **Start**.



Certificate Restore
Action
○ Generate a request file
● Process a response file
Place for request file
Filename: C:\Temp\IMEI\004400281652824.ask
Browse
Place for response file
Filename: C:\Temp\IMEI\004400281652824.RPL
Browse
Start
Close
Help

Next actions

After a successful rewrite, you must retune the phone completely by using *Phoenix* tuning functions.

Important: Perform all tunings: RF, BB, and UI.

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File**→ **Scan Product.**
4. Choose **Tuning**→**Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.

8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 7 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

4 — RF troubleshooting

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  WCDMA RX chain activation for manual measurement/WCDMA RSSI measurement 4–12
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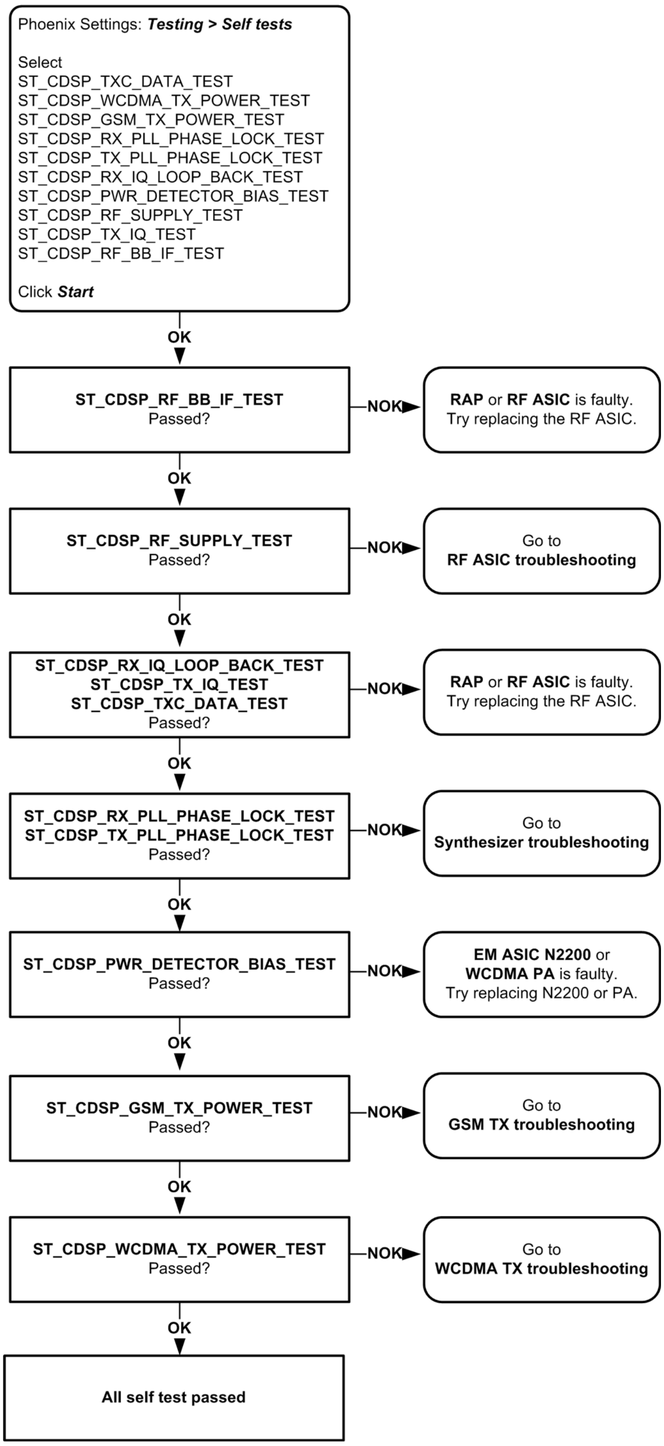
RF self tests in Phoenix

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

Troubleshooting flow


Phoenix Settings: ***Testing > Self tests***
Select
ST_CDSP_TXC_DATA_TEST
ST_CDSP_WCDMA_TX_POWER_TEST
ST_CDSP_GSM_TX_POWER_TEST
ST_CDSP_RX_PLL_PHASE_LOCK_TEST
ST_CDSP_TX_PLL_PHASE_LOCK_TEST
ST_CDSP_RX_IQ_LOOP_BACK_TEST
ST_CDSP_PWR_DETECTOR_BIAS_TEST
ST_CDSP_RF_SUPPLY_TEST
ST_CDSP_TX_IQ_TEST
ST_CDSP_RF_BB_IF_TEST
Click ***Start***
OK
ST_CDSP_RF_BB_IF_TEST Passed?
NOK
RAP or **RF ASIC** is faulty. Try replacing the RF ASIC.
OK
ST_CDSP_RF_SUPPLY_TEST Passed?
NOK
Go to **RF ASIC troubleshooting**
OK
ST_CDSP_RX_IQ_LOOP_BACK_TEST
ST_CDSP_TX_IQ_TEST
ST_CDSP_TXC_DATA_TEST Passed?
NOK
RAP or **RF ASIC** is faulty. Try replacing the RF ASIC.
OK
ST_CDSP_RX_PLL_PHASE_LOCK_TEST
ST_CDSP_TX_PLL_PHASE_LOCK_TEST Passed?
NOK
Go to **Synthesizer troubleshooting**
OK
ST_CDSP_PWR_DETECTOR_BIAS_TEST Passed?
NOK
EM ASIC N2200 or **WCDMA PA** is faulty. Try replacing N2200 or PA.
OK
ST_CDSP_GSM_TX_POWER_TEST Passed?
NOK
Go to **GSM TX troubleshooting**
OK
ST_CDSP_WCDMA_TX_POWER_TEST Passed?
NOK
Go to **WCDMA TX troubleshooting**
OK
All self test passed

General RF troubleshooting

Introduction to RF troubleshooting

Most RF semiconductors are static discharge sensitive

ESD protection must be applied during repair (ground straps and ESD soldering irons).

Pre-baking

These parts are moisture sensitive and must be pre-baked prior to soldering:

- RFIC N7505
- Front End Module (FEM) N7520

Discrete components

In addition to the key-components, there are a number of discrete components (resistors, inductors and capacitors) for which troubleshooting is done mainly by *visual inspection*.

Capacitors: check for short circuits.

Resistors: check value with an ohm meter.

Note: In-circuit measurements should be evaluated carefully

Measuring equipment

All measurements should be done using:

- An oscilloscope for low frequency and DC measurements. Recommended probe: 10:1, 10Mohm//8pF.
- A radio communication tester including RF generator and spectrum analyser, for example Rohde & Schwarz CMU200. (Alternatively a spectrum analyser and an RF generator can be used. Some tests in this guide are not possible to perform if this solution is chosen).

Note: A mobile phone WCDMA transmitter should never be tested with full TX power (only it possible to perform the measurements in a good RF-shielded room). Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.

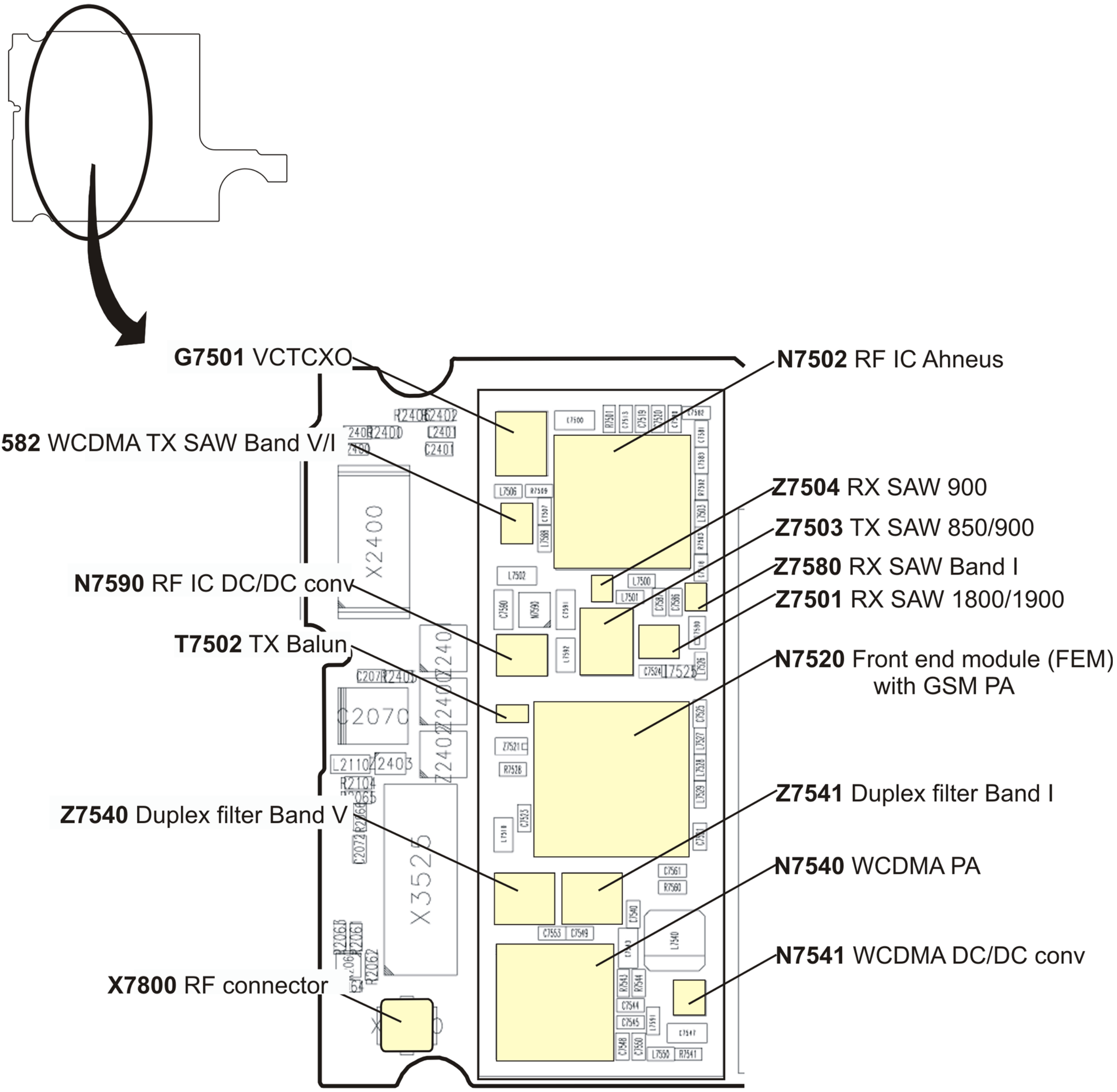
Note: All measurements with an RF coupler should be performed in an RF-shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, testing at frequencies of nearby base stations should be avoided.

Level of repair

The scope of this guideline is to enable repairs at key-component level. Some key-components are not accessible, i.e. not replaceable. Please refer to the list of *Non replaceable RF components*.

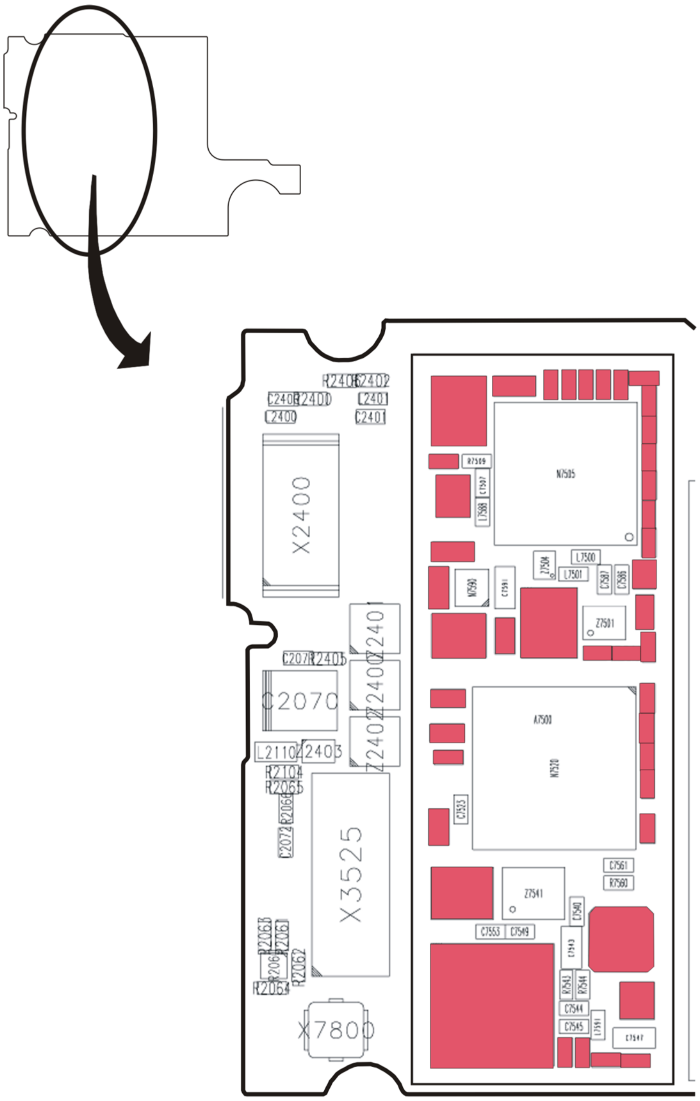
Note: If the RF shieldning can is removed (for measurement or repair), it must always be replaced with a new one.

RF key components


G7501 VCTCXO
N7502 RF IC Ahneus
Z7582 WCDMA TX SAW Band V/I
Z7504 RX SAW 900
Z7503 TX SAW 850/900
Z7580 RX SAW Band I
Z7501 RX SAW 1800/1900
N7590 RF IC DC/DC conv
T7502 TX Balun
N7520 Front end module (FEM) with GSM PA
Z7541 Duplex filter Band I
Z7540 Duplex filter Band V
N7540 WCDMA PA
N7541 WCDMA DC/DC conv
X7800 RF connector
X2400
C2070
X3525

Non-replaceable RF components

The following RF components cannot be replaced because of their location on the PWB:


C2400
C2401
C2401
X2400
Z2401
C2070
Z2400
Z2402
L2110
Z2403
R2104
R2065
C2072
X3525
R2064
X7800
R7509
N7505
L7500
L7501
C7587
C7586
Z7504
N7590
C7591
Z7501
A7500
N7520
C7523
C7561
R7560
Z7541
C7540
C7553
C7549
C7543
R7543
R7544
C7544
C7545
L7591
C7547

Auto tuning for BB5.0

This phone can be tuned automatically.

Autotune is designed to align the phone's RF part easier and faster. It performs calibrations, tunings and measurements of RX and TX. The results are displayed and logged in a result file, if initiated.

Hardware set up

Hardware requirements for auto tuning:

- PC (Windows 2000/XP) with GPIB card
- Power supply
- Product specific module jig
- Cables: XRF-1 (RF cable), USB cable, GBIP cable and DAU-9S
- Signal analyser (TX), signal generator (RX) and RF-splitter *or* one device including all.

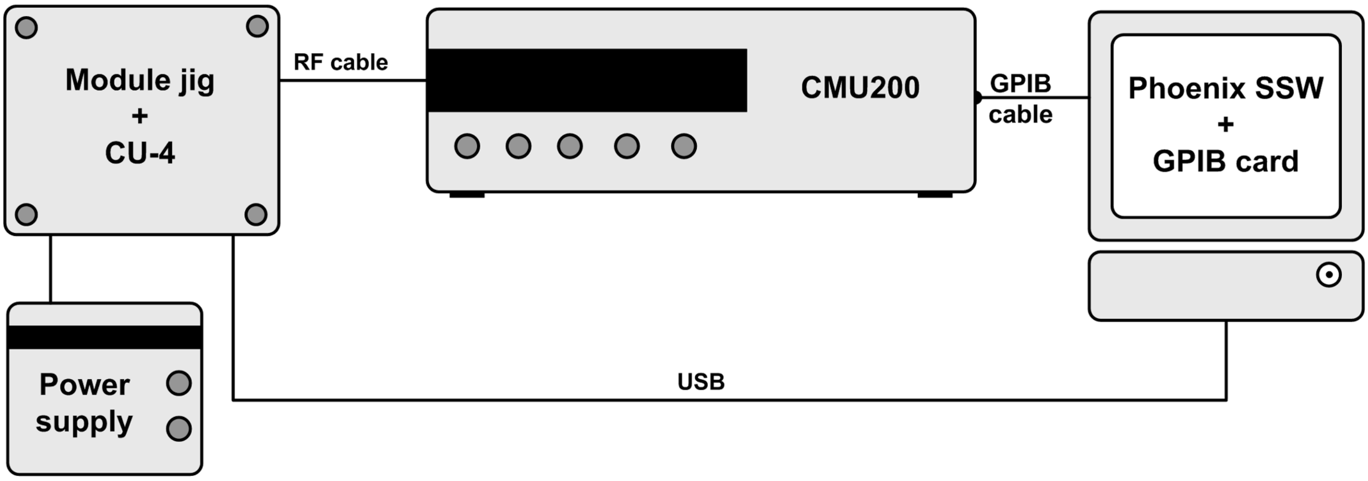


Figure 13 Auto tuning concept with CMU200

> **Note:** Crossover Cable connection between computer and CU200 is recommended (refer to Service Devices chapter and Module Jig concept).

Phoenix preparations

Install the phone specific data package, for example *RM-210_dp_1.78_sw_sh3.26.exe*. This defines phone specific settings..

Auto tuning procedure

1 Make sure the phone (in the jig) is connected to the equipment. Else, some menus will not be shown in Phoenix.

2 To go to autotune, select *Tuning (Alt-U)* > *Auto-Tune (Alt-A)* from the menu.

3 Start autotuning, clicking the *Tune* button.

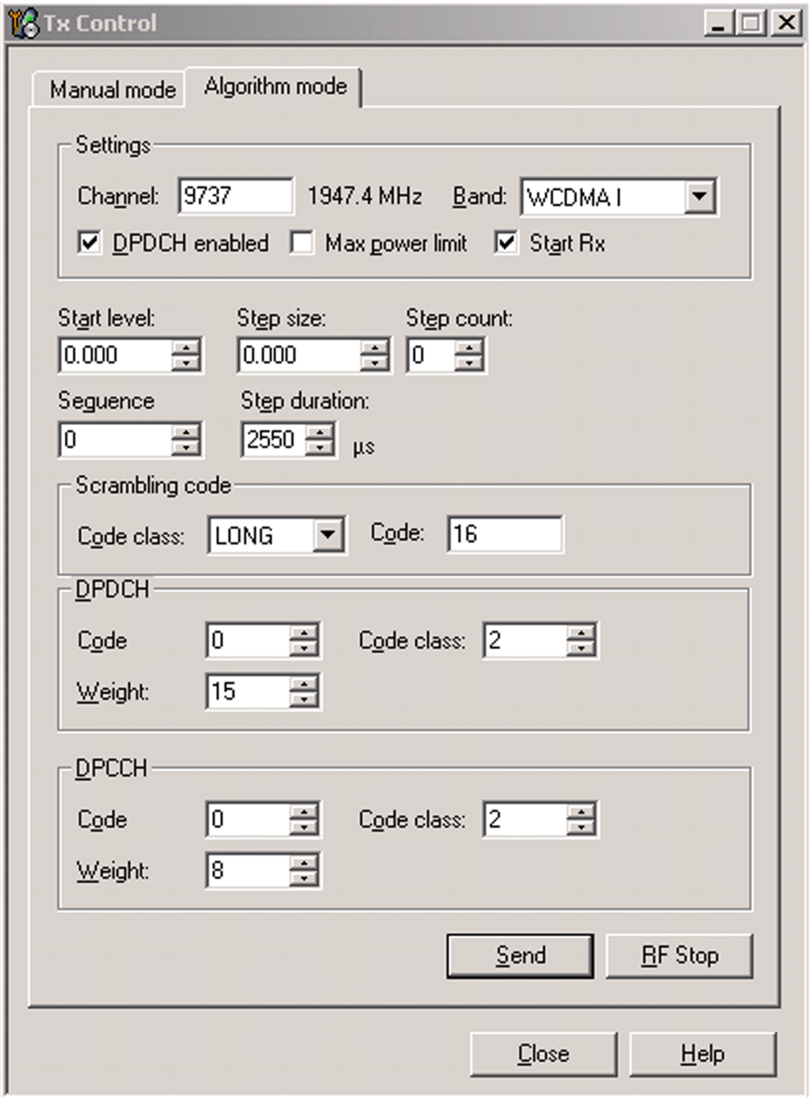
General voltage checking

Steps

1. Set up the main board in the module jig. The phone should be in local mode.
2. Check the following:

#	Signal name	Test point	Voltage (all bands)
1	VCTCXO supply	R7501	2.5 V
2	AHNEUS supply from DC/DC conv	C7590	3.1 V
3	FEM supply	C7523	3.9 V
4	WCDMA PA supply from DC/DC conv	C7543	0 V (1.3 V* when transmitting. Settings as in note below)
5	Vbat at WCDMA PA	C7547	3.9 V
6	Supply input to DC/DC conv	L7591	3.9 V

* With these settings, the result should be 1.3 V.


Tx Control
Manual mode
Algorithm mode
Settings
Scrambling code
DPDCH
DPCCH
Send
RF Stop
Close
Help

Channel: 9737 1947.4 MHz Band: WCDMA I

☑ DPDCH enabled ☐ Max power limit ☑ Start Rx

Start level: 0.000

Step size: 0.000

Step count: 0

Sequence: 0

Step duration: 2550 µs

Scrambling code

Code class: LONG

Code: 16

DPDCH

Code: 0

Code class: 2

Weight: 15

DPCCH

Code: 0

Code class: 2

Weight: 8

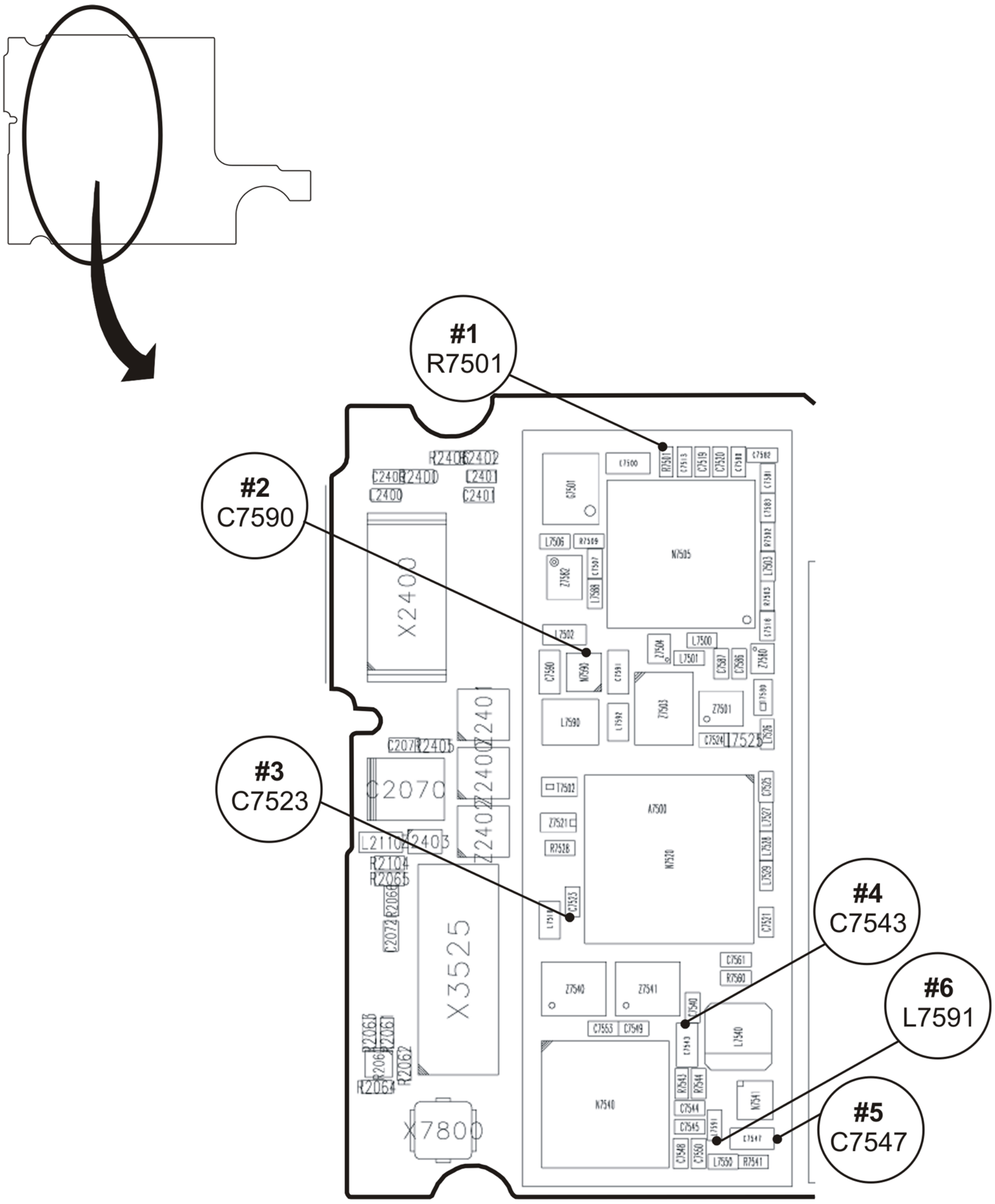

#1
R7501
#2
C7590
#3
C7523
#4
C7543
#5
C7547
#6
L7591
X2400
X3525
X7800
C2070
N7505
A7500
N7540

Figure 14 General voltage checking test points (main board, top side)

Receiver troubleshooting

Introduction to receiver (RX) troubleshooting

RX can be tested by making a phone call or in local mode. For the local mode testing, use Phoenix service software.

The main RX troubleshooting measurement is RSSI reading. This test measures the signal strength of the received signal. For GSM RSSI measurements, see *GSM RX chain activation for manual measurements/GSM RSSI measurement*. For a similar test in WCDMA mode, see *WCDMA RSSI measurement*.

GSM RX chain activation for manual measurements/GSM RSSI measurement

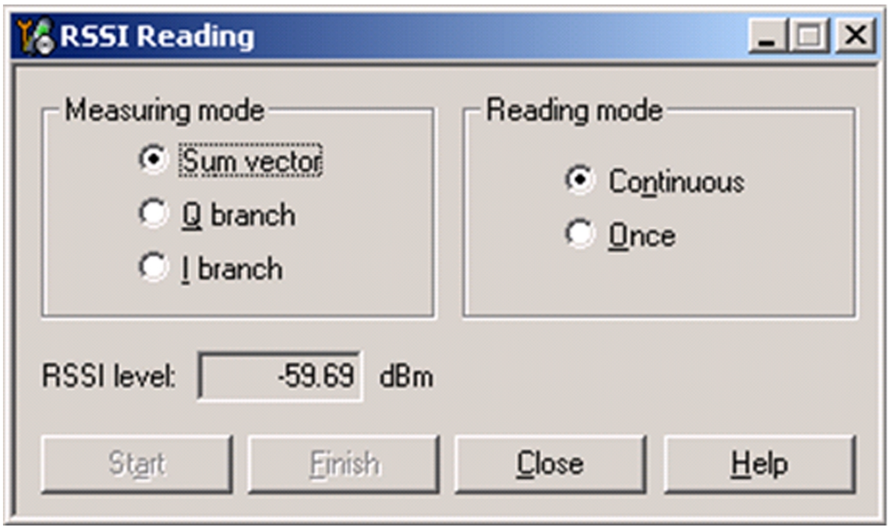
Prerequisites

Make the following settings in Phoenix service software and in the signal generator:

Setting	GSM850	GSM900	GSM1800	GSM1900
Phoenix Channel	190	37	700	661
Signal generator to antenna connector	881.66771 MHz (67.71kHz offset) at -60dBm	942.46771 MHz (67.71kHz offset) at -60dBm	1842.86771 MHz (67.71kHz offset) at -60dBm	1960.046771 MHz (67.71kHz offset) at -60dBm

Steps

1. Set the phone to local mode.
2. Activate RSSI reading in Phoenix (**Testing→GSM→RSSI reading**)



RSSI Reading

Measuring mode

● Sum vector

○ Q branch

○ I branch

Reading mode

● Continuous

○ Once

RSSI level: -59.69 dBm

Results

With the *Measuring mode* set to *Sum vector*, the reading should reflect the level of the signal generator (- losses) +/- 5 dB.

When varying the level in the range -30 to -102 dBm the reading should then follow within +/-5 dB.

Now select the measuring mode to *Q branch* and *I Branch*. In each case the reading should be 3 dB below the signal generator level.

WCDMA RX chain activation for manual measurement/WCDMA RSSI measurement

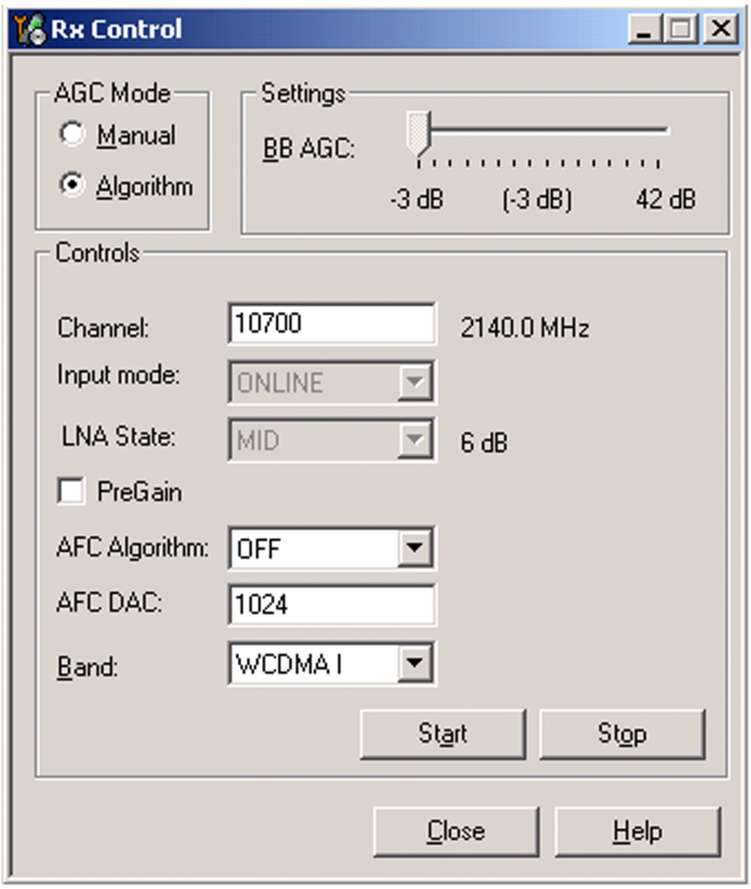
Prerequisites

Make the following settings in Phoenix service software and in the signal generator.

Setting	Band I	Band V
Phoenix channel	10700	4407
Signal generator to antenna connector	21400 MHz	881.4 MHz

Steps

1. Via Phoenix Testing menu, choose **WCDMA/RX Control**.
2. In the RX control window, make the following settings:


Rx Control
AGC Mode
Settings
Controls
Start
Stop
Close
Help

AGC Mode: ○ Manual ● Algorithm

BB AGC: -3 dB (-3 dB) 42 dB

Channel: 10700 2140.0 MHz

Input mode: ONLINE

LNA State: MID 6 dB

☐ PreGain

AFC Algorithm: OFF

AFC DAC: 1024

Band: WCDMA I

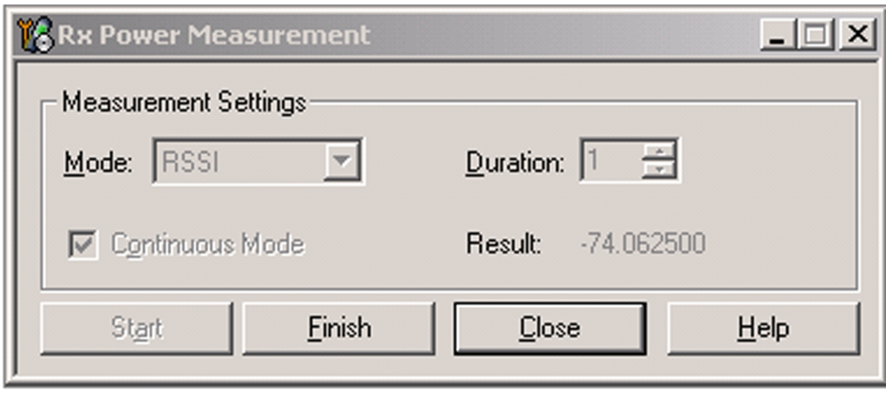
Figure 15 RX Control window with example settings

3. Click **Start** to activate the settings.

   If the settings are changed later on (for example, change of channel) you have to click **Stop** and **Start** again.

   Note: Clicking **Stop** also disables TX control if it was active.

4. From the Phoenix testing menu, select **WCDMA→RX Power measurement**
5. In the RX Power measurement window, select:
   - Mode: RSSI
   - Continuous mode


Rx Power Measurement
Measurement Settings
Start
Finish
Close
Help

Mode: RSSI

Duration: 1

☑ Continuous Mode

Result: -74.062500

6. Click **Start** to perform the measurement.

Results

The reading should reflect the level of the signal generator (-losses) ± 5 dB.

Transmitter troubleshooting

General instructions for transmitter (TX) troubleshooting

Please note the following before performing transmitter tests:

- TX troubleshooting requires TX operation.
- Do not transmit on frequencies that are in use!
- The transmitter can be controlled in local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is “RF Controls”; in WCDMA transmitter testing the best tool is “TX Control”.
- Remember that re-tuning is not a fix! Phones are tuned correctly in production

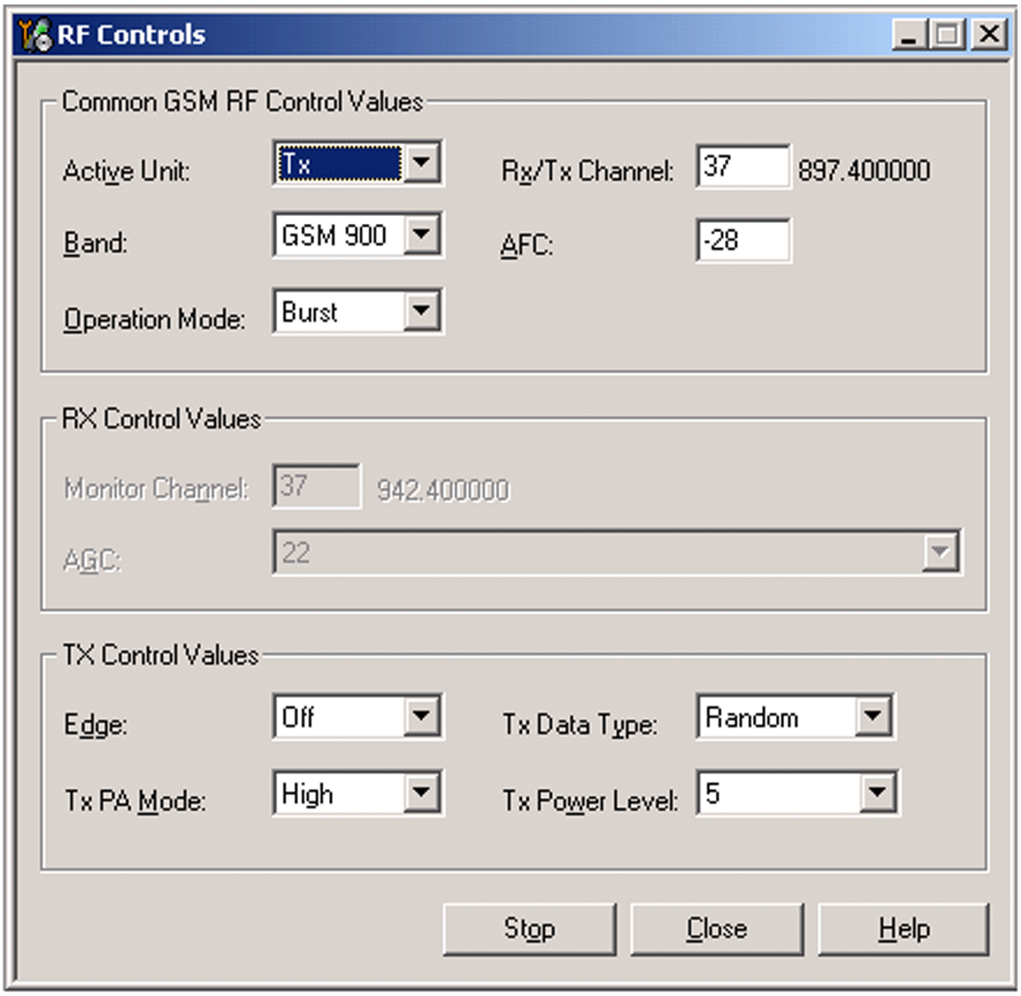
Note: Never activate the GSM or WCDMA transmitter without a proper antenna load. Always connect a 50 Ω load to the RF connector (antenna, RF-measurement equipment or at least a 2 W dummy load); otherwise the GSM or WCDMA Power amplifier (PA) may be damaged.

GSM transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. Activate RF controls in Phoenix (**Testing→GSM→Rf Controls**).

   Make settings as shown in the picture:



RF Controls

Common GSM RF Control Values

Active Unit: Tx

Rx/Tx Channel: 37 897.400000

Band: GSM 900

AFC: -28

Operation Mode: Burst

RX Control Values

Monitor Channel: 37 942.400000

AGC: 22

TX Control Values

Edge: Off

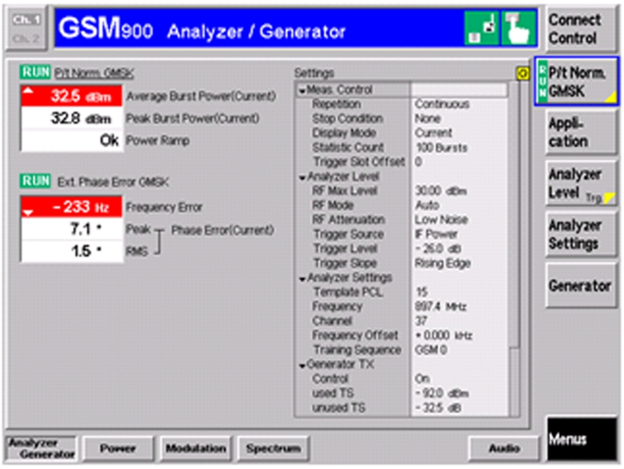
Tx Data Type: Random

Tx PA Mode: High

Tx Power Level: 5

3. Check the basic TX parameters (i.e. power, phase error, modulation and switching spectrum), using a communication analyser (for example CMU200).

Analyser settings

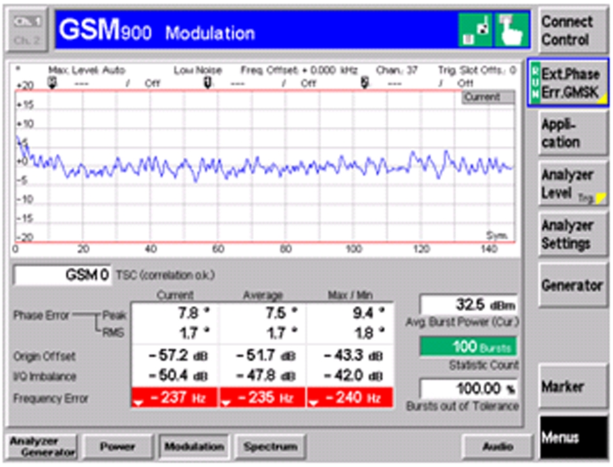

GSM900 Analyzer / Generator
Connect Control
P/t Norm. GMSK
Appli-cation
Analyzer Level Trg
Analyzer Settings
Generator
Menus
Analyzer Generator
Power
Modulation
Spectrum
Audio

RUN P/t Norm. GMSK
32.5 dBm Average Burst Power(Current)
32.8 dBm Peak Burst Power(Current)
Ok Power Ramp

RUN Ext. Phase Error GMSK
-233 Hz Frequency Error
7.1 ° Peak Phase Error(Current)
1.5 ° RMS

Settings
Meas. Control
Repetition Continuous
Stop Condition None
Display Mode Current
Statistic Count 100 Bursts
Trigger Slot Offset 0
Analyzer Level
RF Max Level 30.00 dBm
RF Mode Auto
RF Attenuation Low Noise
Trigger Source IF Power
Trigger Level -26.0 dB
Trigger Slope Rising Edge
Analyzer Settings
Template PCL 15
Frequency 897.4 MHz
Channel 37
Frequency Offset +0.000 kHz
Training Sequence GSM 0
Generator TX
Control On
used TS -92.0 dBm
unused TS -32.5 dB

Phase error

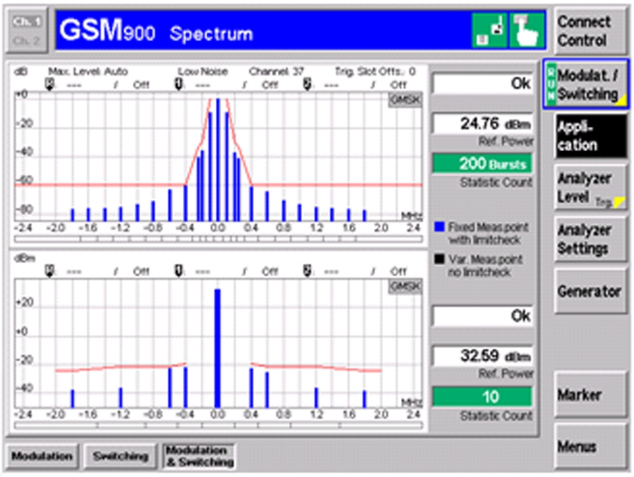

GSM900 Modulation
Connect Control
Ext.Phase Err.GMSK
Appli-cation
Analyzer Level Trg
Analyzer Settings
Generator
Marker
Menus
Analyzer Generator
Power
Modulation
Spectrum
Audio
Max. Level: Auto / Off
Low Noise
Freq. Offset: +0.000 kHz
Chan.: 37
Trig. Slot Offs.: 0 / Off
Current
+20
+15
+10
+5
-5
-10
-15
-20
Sym.
0
20
40
60
80
100
120
140

GSM 0 TSC (correlation o.k.)

		Current	Average	Max / Min
Phase Error	Peak	7.8 °	7.5 °	9.4 °
	RMS	1.7 °	1.7 °	1.8 °
Origin Offset		-57.2 dB	-51.7 dB	-43.3 dB
I/Q Imbalance		-50.4 dB	-47.8 dB	-42.0 dB
Frequency Error		-237 Hz	-235 Hz	-240 Hz

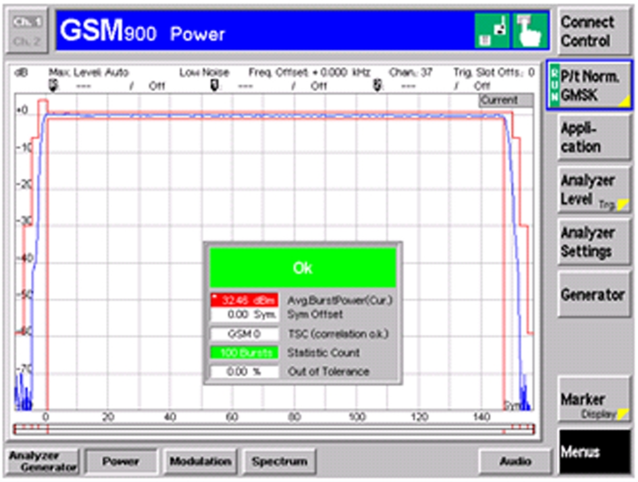
32.5 dBm Avg. Burst Power (Cur.)
100 Bursts Statistic Count
100.00 % Bursts out of Tolerance

Modulation/Switching spectrum


GSM900 Spectrum
Connect Control
Modulat. / Switching
Appli-cation
Analyzer Level Trg
Analyzer Settings
Generator
Marker
Menus
Modulation
Switching
Modulation & Switching
dB
dBm
Max. Level: Auto / Off
Low Noise
Channel: 37
Trig. Slot Offs.: 0 / Off
GMSK
+0
-20
-40
-60
-80
+20
MHz
-2.4
-2.0
-1.6
-1.2
-0.8
-0.4
0.0
0.4
0.8
1.2
1.6
2.0
2.4
Fixed Meas.point with limitcheck
Var. Meas.point no limitcheck

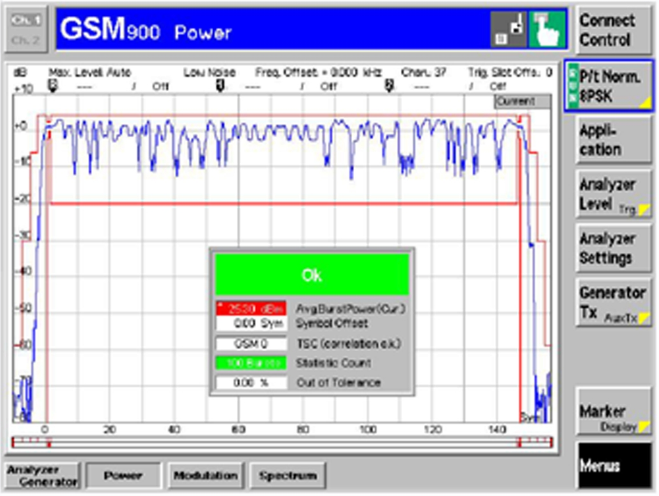
Ok
24.76 dBm Ref. Power
200 Bursts Statistic Count
Ok
32.59 dBm Ref. Power
10 Statistic Count

Power/Burst


GSM900 Power
Connect Control
P/t Norm. GMSK
Appli-cation
Analyzer Level Trg
Analyzer Settings
Generator
Marker Display
Menus
Analyzer Generator
Power
Modulation
Spectrum
Audio
dB
Max. Level: Auto / Off
Low Noise
Freq. Offset: +0.000 kHz
Chan.: 37
Trig. Slot Offs.: 0 / Off
Current
+0
-10
-20
-30
-40
-50
-60
-70
Sym.
0
20
40
60
80
100
120
140

Ok
32.46 dBm Avg.BurstPower(Cur.)
0.00 Sym. Sym.Offset
GSM 0 TSC (correlation o.k.)
100 Bursts Statistic Count
0.00 % Out of Tolerance

Edge


GSM900 Power
Connect Control
P/t Norm. 8PSK
Appli-cation
Analyzer Level Trg
Analyzer Settings
Generator Tx AuxTx
Marker Display
Menus
Analyzer Generator
Power
Modulation
Spectrum
dB
Max. Level: Auto / Off
Low Noise
Freq. Offset: +0.000 kHz
Chan.: 37
Trig. Slot Offs.: 0 / Off
Current
+10
+0
-10
-20
-30
-40
-50
-60
-70
Sym.
0
20
40
60
80
100
120
140

Ok
25.30 dBm Avg.BurstPower(Cur.)
0.00 Sym. Symbol Offset
GSM 0 TSC (correlation o.k.)
100 Bursts Statistic Count
0.00 % Out of Tolerance

Figure 16 Typical readings

4. Change power level (RF controls) and make sure the power reading follows accordingly.

Next actions

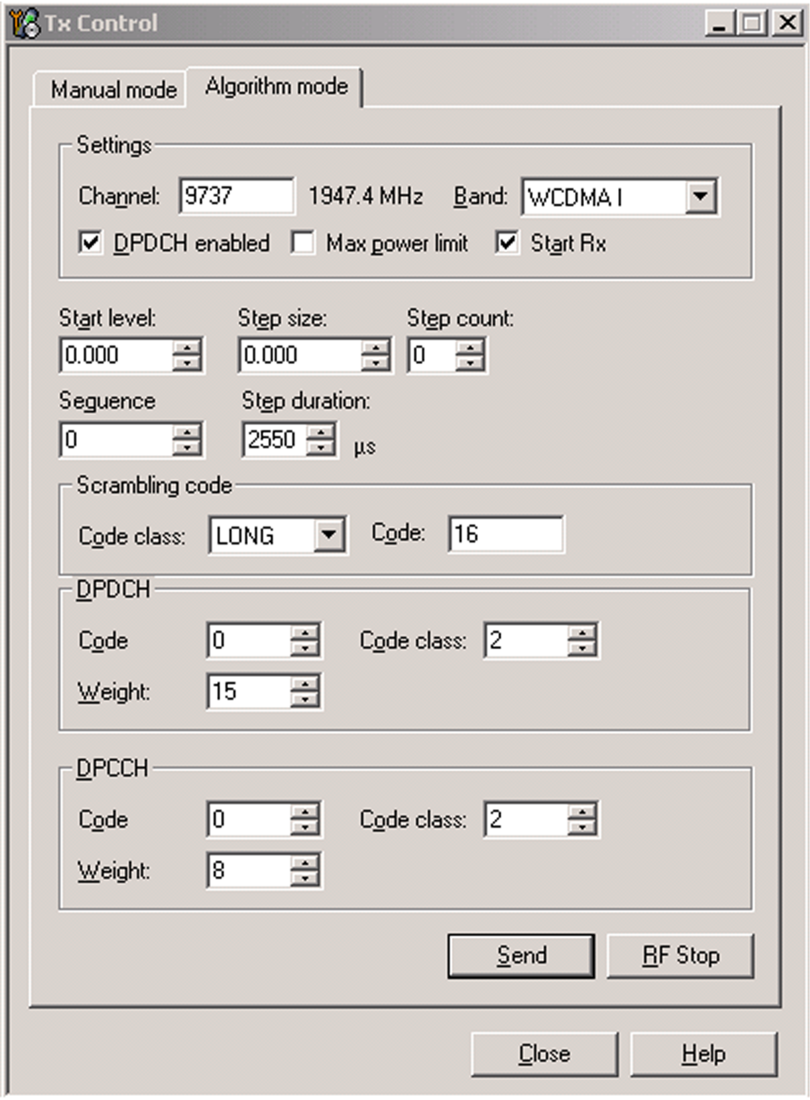
If you want to troubleshoot the other bands, change band with RF controls and set the communication analyser accordingly.

WCDMA transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. In Phoenix, select **Testing→WCDMA→TX control** .
3. In the TX control window, make settings as shown in the picture:

   Note: *Star level* is the expected power out.



Settings
Channel: 9737 1947.4 MHz Band: WCDMA I
☑ DPDCH enabled ☐ Max power limit ☑ Start Rx

Start level: 0.000
Step size: 0.000
Step count: 0
Sequence 0
Step duration: 2550 µs

Scrambling code
Code class: LONG
Code: 16

DPDCH
Code 0
Code class: 2
Weight: 15

DPCCH
Code 0
Code class: 2
Weight: 8

4. Click **Send** to enable the settings and activate TX.

   If settings are changed (eg. new channel), you have to click **RF Stop** and **Send** again.
5. Check the basic TX parameters (i.e. power and EVM) using a communication analyser (eg. CMU200).
6. To repeat the test for other bands, select the correct band in the TX control and repeat the measurements.

Bluetooth troubleshooting

Troubleshooting flow

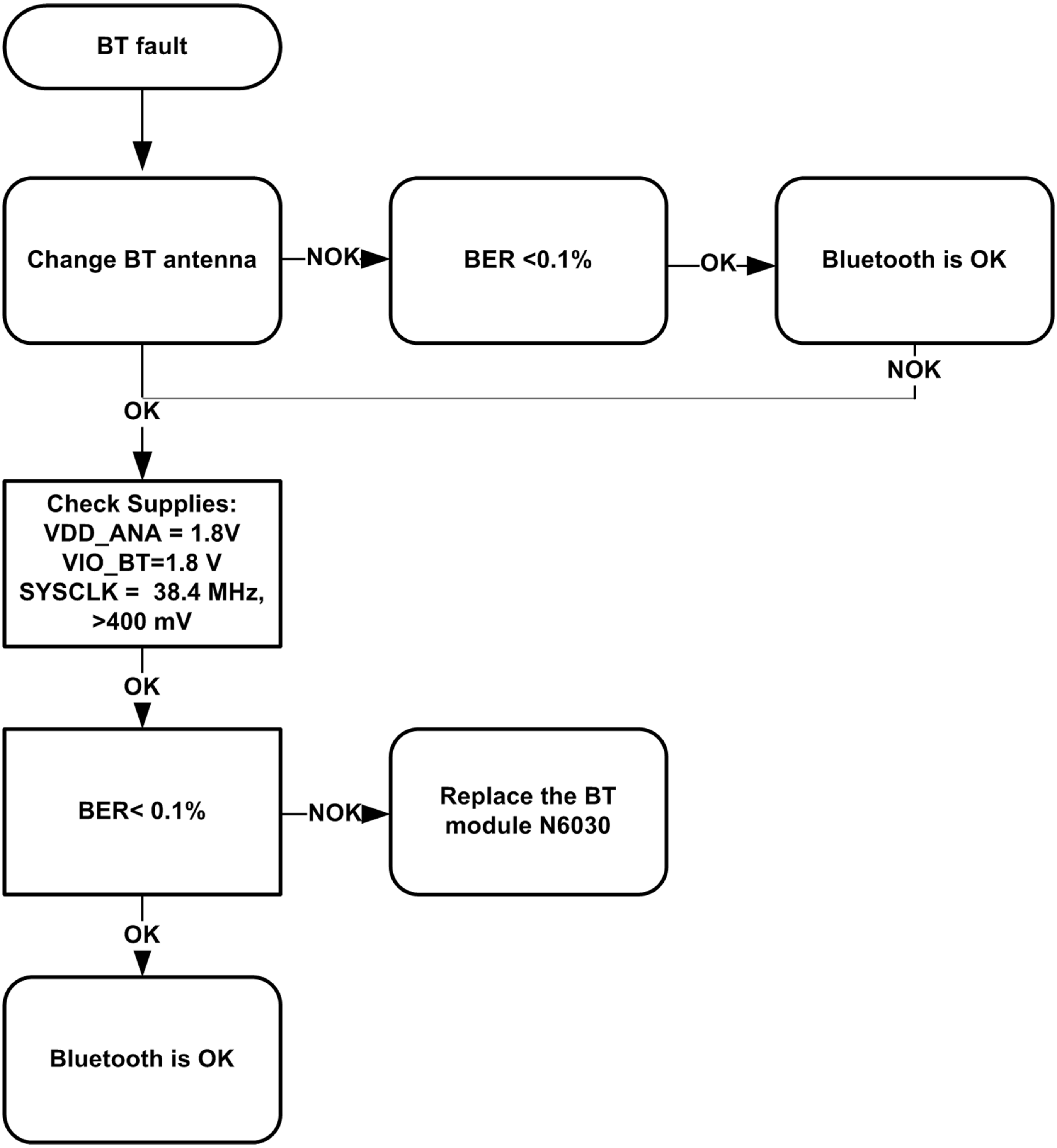

BT fault
Change BT antenna
NOK
BER <0.1%
OK
Bluetooth is OK
NOK
OK
Check Supplies:
VDD_ANA = 1.8V
VIO_BT=1.8 V
SYSCLK = 38.4 MHz,
>400 mV
OK
BER< 0.1%
NOK
Replace the BT
module N6030
OK
Bluetooth is OK

Figure 17 Troubleshooting diagram: Bluetooth

5 — System Module

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  Media memory.....5–12
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Introduction

Phone description

RAP is the main digital baseband ASIC in the phone. It contains functionality for both WCDMA and GSM EDGE. The hardware accelerator is used as a camera accelerator.

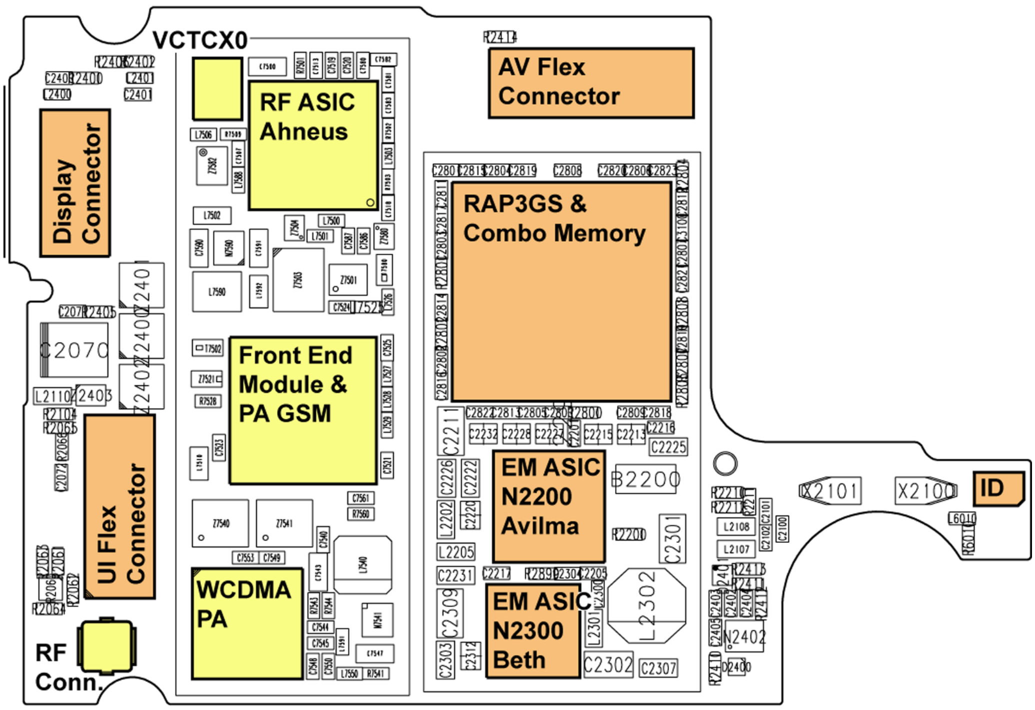
N2200 (AVILMA) is mainly the audio ASIC in the phone and N2300 (BETTY) is basically the energy management controller for the phone.

Key components

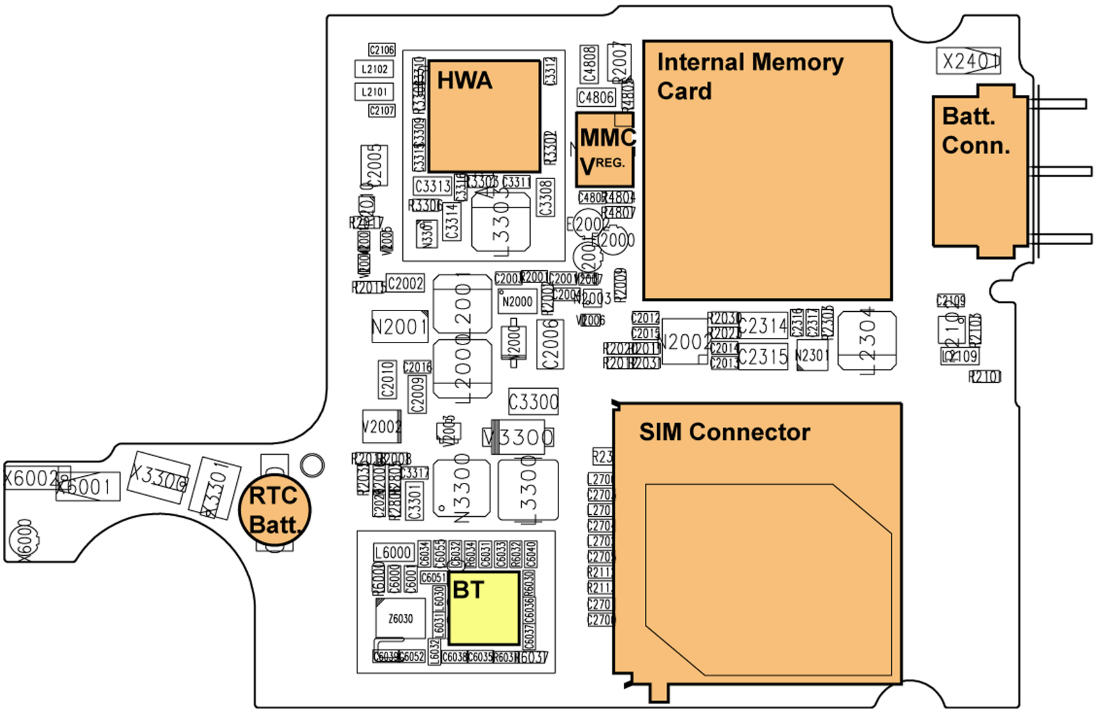
Function	Description	Item ref
Main board	2dva	
Energy management ASIC	AVILMA BETTY	N2200 N2300
RF ASIC	Ahneus	N7505
Processor	RAP3GS v2.0	D2800
Hardware (camera) accelerator	ST984	D3300
PA GSM	Front end module (FEM), quad band	N7520
PA WCDMA	Triple band PA	N7540
Oscillators	VCTCXO	G7501
Memory	512 Mbit NOR + 256 Mbit DRAM Combo (Stacked with RAP)	D2802
Back-up battery	RTC back-up battery 311	G2200
Bluetooth	BC4-ROM1	D6030
Battery	BL-6P 850 mAh	
Battery connector	Tabby blade interface	X2070
Internal memory card	NAND 1GB HS-MMC	D4800
µUSB connector	For data, charging and audio	AV flex: X2080

Key component placement

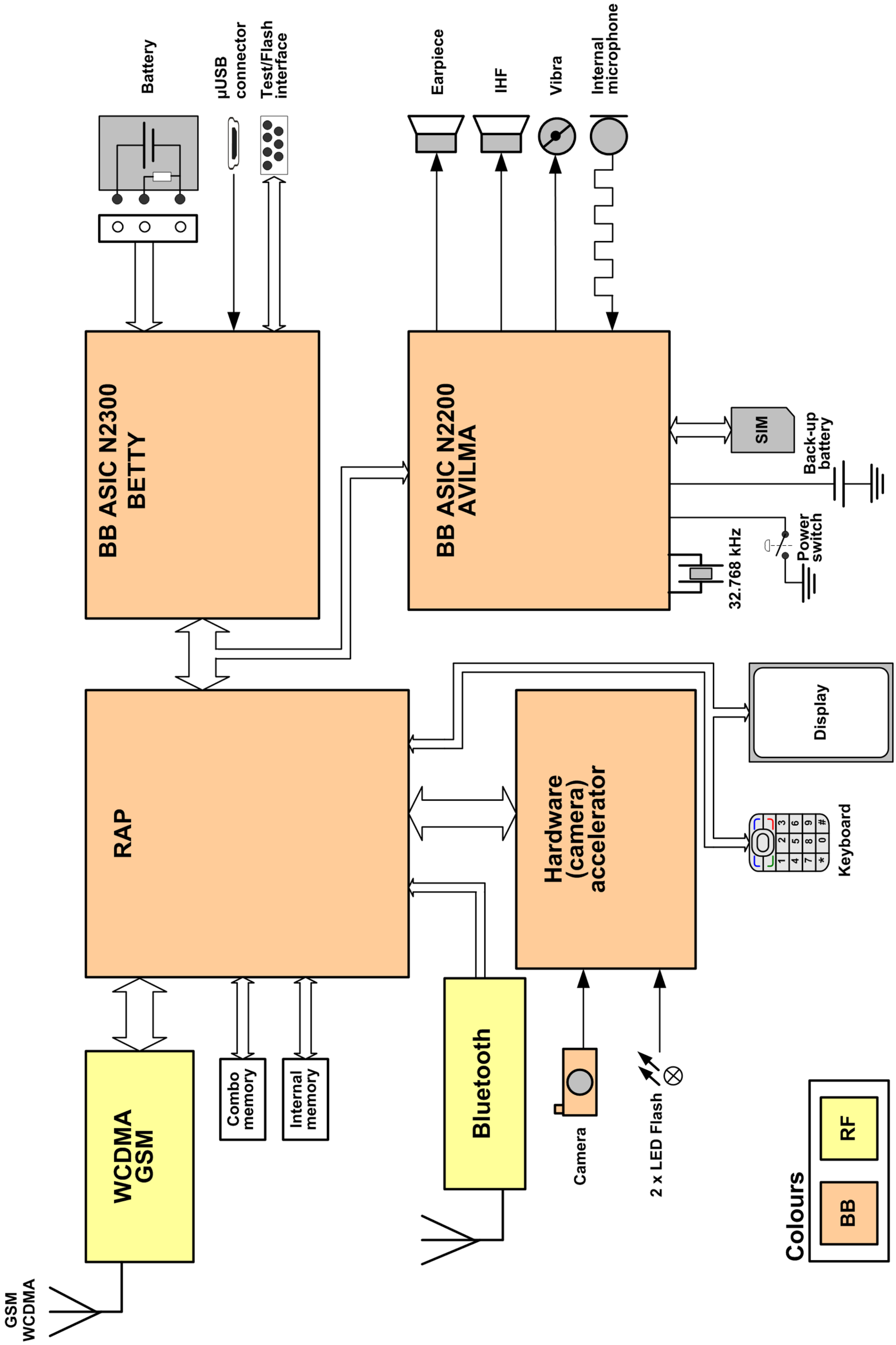
Top Side


VCTCX0
RF ASIC
Ahneus
AV Flex
Connector
Display
Connector
RAP3GS &
Combo Memory
Front End
Module &
PA GSM
UI Flex
Connector
EM ASIC
N2200
Avilma
B2200
X2101
X2100
ID
WCDMA
PA
EM ASIC
N2300
Beth
L2302
N2402
RF
Conn.

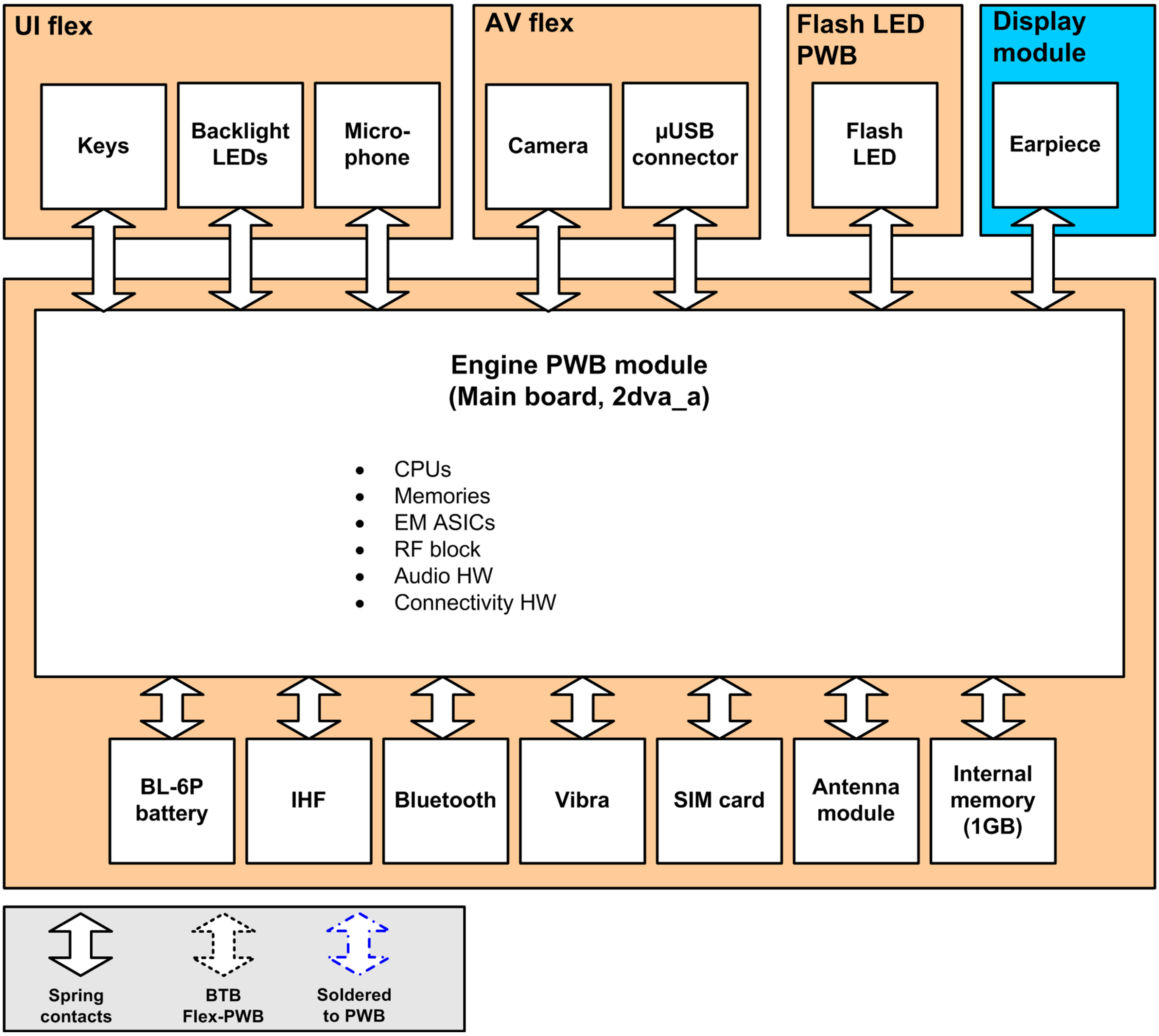
Bottom Side


HWA
Internal Memory
Card
MMC
VREG.
X2401
Batt.
Conn.
N2001
N2000
L2304
C3300
V3300
N3300
SIM Connector
X6002
X6001
X3306
X3301
RTC
Batt.
BT
L6000
Z6030

System module block diagram


Battery
µUSB connector
Test/Flash interface
Earpiece
IHF
Vibra
Internal microphone
BB ASIC N2300 BETTY
BB ASIC N2200 AVILMA
SIM
Back-up battery
32.768 kHz
Power switch
RAP
Hardware (camera) accelerator
Display
Keyboard
WCDMA GSM
Combo memory
Internal memory
Bluetooth
Camera
2 x LED Flash
GSM WCDMA
Colours
BB
RF

Board and module connections


UI flex
Keys
Backlight LEDs
Micro-phone
AV flex
Camera
µUSB connector
Flash LED PWB
Flash LED
Display module
Earpiece
Engine PWB module
(Main board, 2dva_a)
CPUs
Memories
EM ASICs
RF block
Audio HW
Connectivity HW
BL-6P battery
IHF
Bluetooth
Vibra
SIM card
Antenna module
Internal memory (1GB)
Spring contacts
BTB Flex-PWB
Soldered to PWB

Energy management

Battery and charging

BL-6P battery

The phone is powered by a 3-pole BL-6P 850 mAh battery. The three poles are named VBAT, BSI and GND where the BSI line is used to recognize the battery capacity. This is done by means of an internal battery pull down resistor.

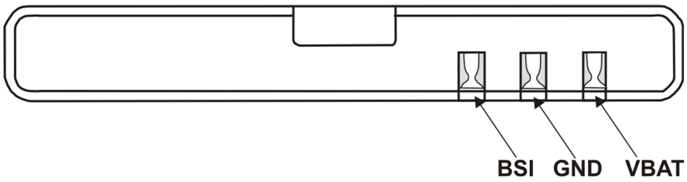


Figure 18 Battery pin order

The battery temperature can be measured from the UI flex.

Battery connector

The battery connector is a blade connector. It has three blades;

- BSI (Battery size indicator)
- GND (Ground)
- VBAT (Battery voltage)

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

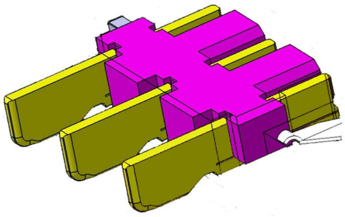


Figure 19 Battery connector

Charging

This phone is charged through the μUSB interface only (there is no separate connector for a charger).

Charging is controlled by energy management, and external components are needed to protect the baseband module against EMC, reverse polarity and transient frequency deviation.

Charging a dead battery

Charging of a dead battery has to be carried out via one of the two approved NOKIA chargers (AC-6 and DC-6). Charging via a PC is not allowed since this procedure is not including a current regulator (the battery can be charged with a too high current level).

Normal and extreme voltages

Energy management is mainly carried out in the two Application Specific Integrated Circuits (ASICs) N2300 BETTY and N2200 AVILMA. These two circuits contains a number of regulators. In addition there are some external regulators too.

In the table below normal and extreme voltages are shown when a BL-6P battery is used.

Table 8 Nominal voltages

Voltage	Voltage [V]	Condition
General Conditions		
Nominal voltage	4.0	
Lower extreme voltage	3.4	
Higher extreme voltage (fast charging)	4.4	

Voltage	Voltage [V]	Condition
HW Shutdown Voltages		
Vmstr+	2.2 ± 0.1	Off to on
Vmstr-	2.2 ± 0.1	On to off
SW Shutdown Voltages		
Sw shutdown	3.1	In call
Sw shutdown	3.2	In idle
Min Operating Voltage		
Vcoff+	2.9 ± 0.1	Off to on
Vcoff-	2.6 ± 0.1	On to off

Power key and system power-up

When the battery is placed in the phone the power key circuits are energized. When the power key is pressed, the system boots up (if an adequate battery voltage is present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW). The power key is connected to EM ASIC N2200 (AVILMA) via PWRONX signal.

Modes of operation

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below N2200 AVILMA master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32 kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over N2300 BETTY master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) mode is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. RESET mode uses 32 kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low.
FLASHING	FLASHING mode is for SW downloading.

Clocking scheme

In BB5.0, two main clocks are provided to the system: 38.4MHz RF clock produced by VCTCXO in RF section and 32.768kHz sleep clock produced by EM ASIC N2200 with an external crystal.

32 k Sleep Clock is always powered on after startup. Sleep clock is used by RAP for low-power operation.

SMPS Clk is 2.4 MHz clock line from RAP to EM ASIC N2300. In deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

BT Clk is 38.4 MHz signal from Ahneus ASIC to BT module.

CLK600. The clock source is an internal RC oscillator in EM ASIC N2300 (during the power-up sequence) or RAPIDO SMPS Clk.

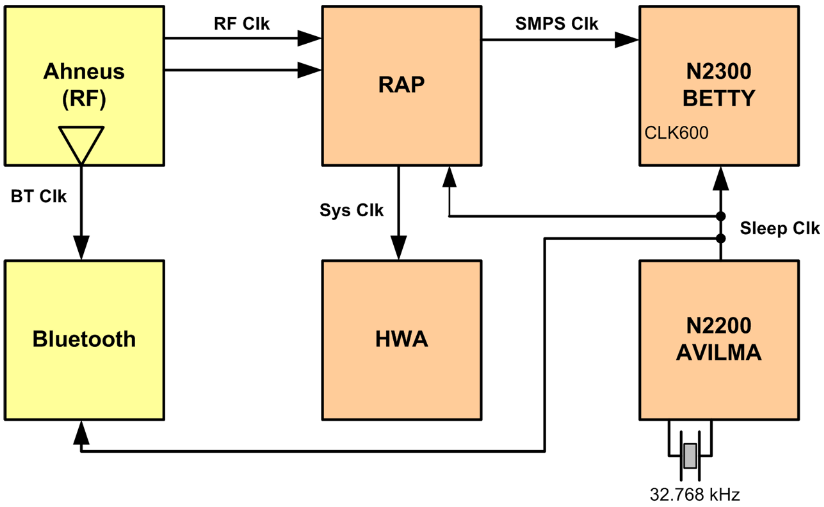

Ahneus
(RF)
RF Clk
RAP
SMPS Clk
N2300
BETTY
CLK600
BT Clk
Sys Clk
Sleep Clk
Bluetooth
HWA
N2200
AVILMA
32.768 kHz

Figure 20 Clocking scheme

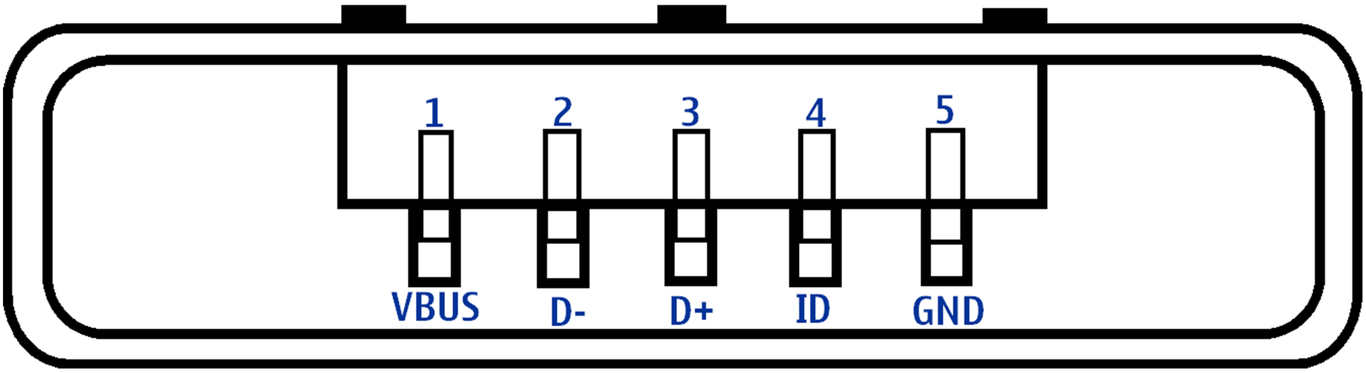
USB, SIM, MMC

USB

In this phone the USB connector is the only physical connector, which means that the USB port is used both for headsets, data transfer as well as for charging. The USB 2.0 is supported with full speed (12 Mbps).

It also supports hot swap, which means that USB devices may be plugged in/out at any time.

This phone is provided with a specific connector for μUSB.


1
2
3
4
5
VBUS
D-
D+
ID
GND

SIM interface

The device has one SIM (Subscriber Identification Module) interface. It is only accessible if battery is removed. The SIM interface consists of an internal interface between RAP and EM ASIC (N2200), and of an external interface between N2200 and SIM contacts.

The SIM IF is shown in the following figure:

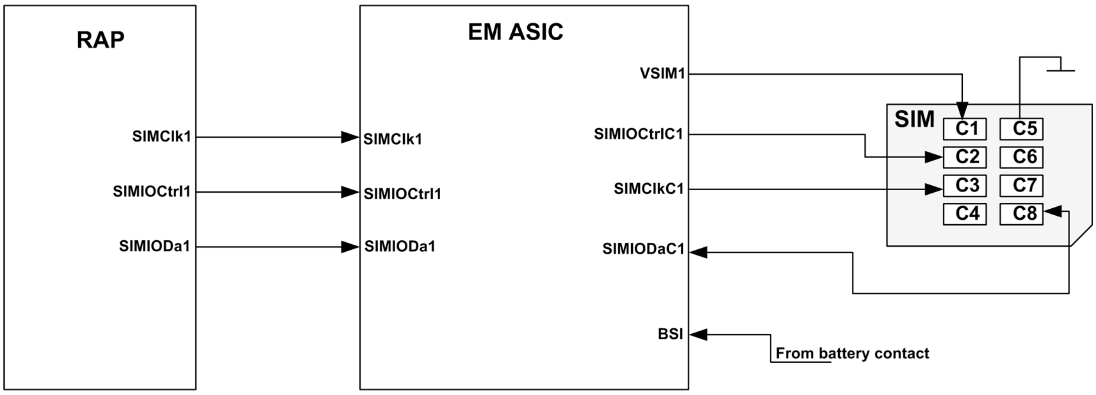
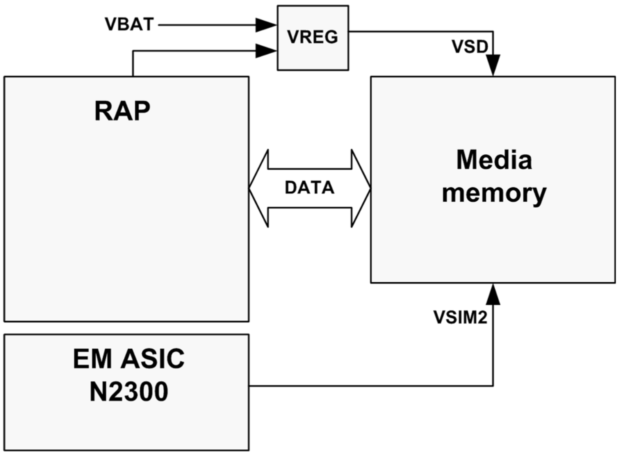

RAP
SIMClk1
SIMIOCtrl1
SIMIODa1
EM ASIC
SIMClk1
SIMIOCtrl1
SIMIODa1
VSIM1
SIMIOCtrlC1
SIMClkC1
SIMIODaC1
BSI
SIM
C1
C2
C3
C4
C5
C6
C7
C8
From battery contact

Figure 21 SIM interface

The EM ASIC handles the detection of the SIM card. The detection method is based in the BSI line. Because of the location of the SIM card, removing the battery causes a quick power down of the SIM interface.

The SIM interface supports both 1.8 V and 3.0 V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR a 3 V interface voltage is used.

Media memory


VBAT
VREG
VSD
RAP
DATA
Media memory
VSIM2
EM ASIC N2300

This phone has a media memory, an MMC memory chip soldered to the main board. It is connected directly to RAP.

Supplied voltages:

- VSIM2: 1.8 V (from EM ASIC N2300)
- VSD: 2.8 V (enabled by RAP)

Camera concept

This phone has a 2.0 megapixel camera module and a LED flash. Both are controlled by RAP via the hardware accelerator.

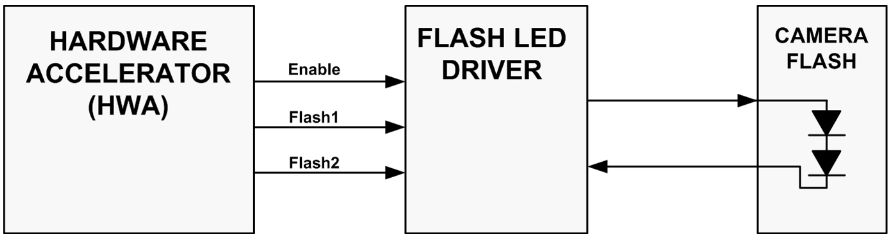

HARDWARE ACCELERATOR (HWA)
Enable
Flash1
Flash2
FLASH LED DRIVER
CAMERA FLASH

Figure 22 Camera flash LED block diagram

User interface

Display module

The interconnection between the LCD module and the engine is implemented with a 24-pin board-to-board connector.

The LCD module does not require any tuning in service.

Keyboard

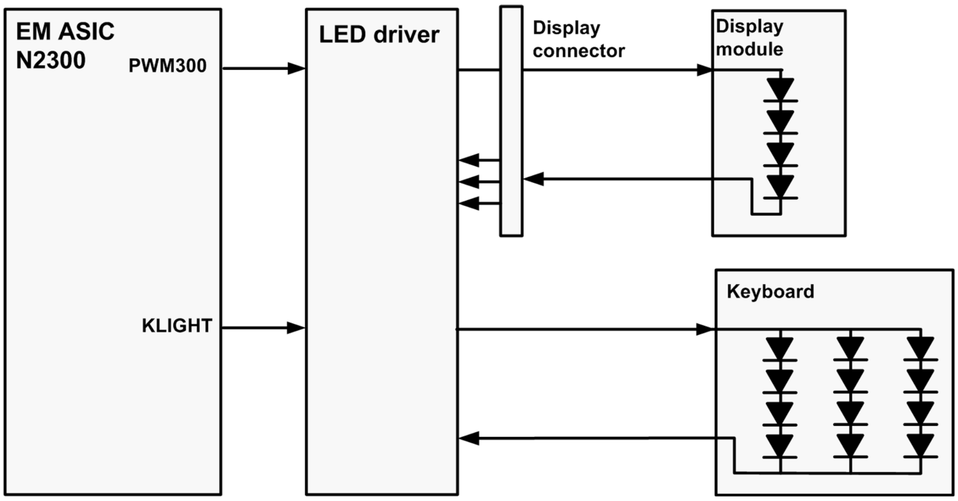
Table 9 Key signal matrix

GENIO		36	37	38	39
		KEYB_CMT8 (COL0)	KEYB_CMT9 (COL1)	KEYB_CMT10 (COL2)	KEYB_CMT11 (COL3)
32	KEYB_CMT0 (ROW0)	Soft left		Soft right	Up
33	KEYB_CMT1 (ROW1)	Send			Select
34	KEYB_CMT2 (ROW2)	1	2	3	Left
35	KEYB_CMT3 (ROW3)	4	5	6	Down
41	KEYB_CMT4 (ROW4)	7	8	9	Right
42	KEYB_CMT5 (ROW5)	*	0	#	

Backlight and illumination

There is backlight illuminating the display.

The keypad is top lit by 3 LEDs.


EM ASIC
N2300
PWM300
KLIGHT
LED driver
Display connector
Display module
Keyboard

Ambient light sensor (ALS)

The ambient light sensor (ALS) consists of

- a lightguide
- a light sensor + a decoupling capacitor (last one not important for ALS operation)
- EM ASIC N2200

The ambient light sensor is used to control the lights of the phone:

- Keyboard lightning is switched on only when environment is dark/dim
- Display backlights are dimmed when environment is dark/dim.

The ambient light sensor itself is a photo transistor.

Audio concept

The functional core of the audio hardware is built around EM ASIC N2200 and RAP.

N2200 provides an interface for the trancducers. Integrated hands free (IHF) stereo speakers are driven by D-class audio amplifiers.

There are three audio transducers:

- 1digital microphone
- 1 earpiece
- 1 IHF (internal handsfree) speaker

N2200 also provides an output for the vibra motor.

Most headsets, or other external audio accessories, can only be connected via bluetooth.

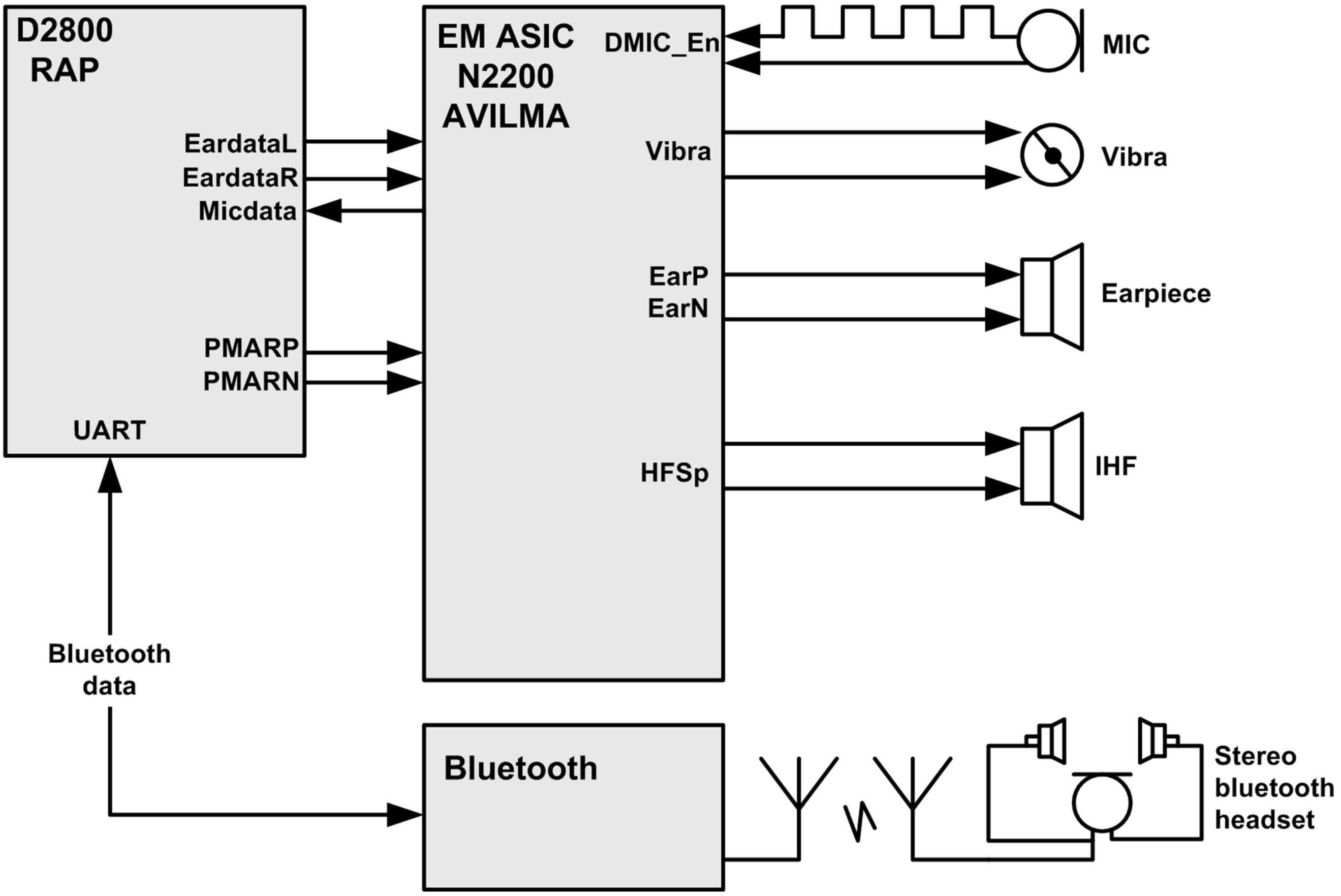

D2800
RAP
EardataL
EardataR
Micdata
PMARP
PMARN
UART
Bluetooth
data
EM ASIC
N2200
AVILMA
DMIC_En
Vibra
EarP
EarN
HFSp
MIC
Vibra
Earpiece
IHF
Bluetooth
Stereo
bluetooth
headset

Figure 23 Audio block diagram

Internal audio

The internal audio components are used in these modes:

	Hand portable (HP) mode	Internal hands free (IHF) mode
Microphone	X	X
Earpiece	X	
Speaker		X

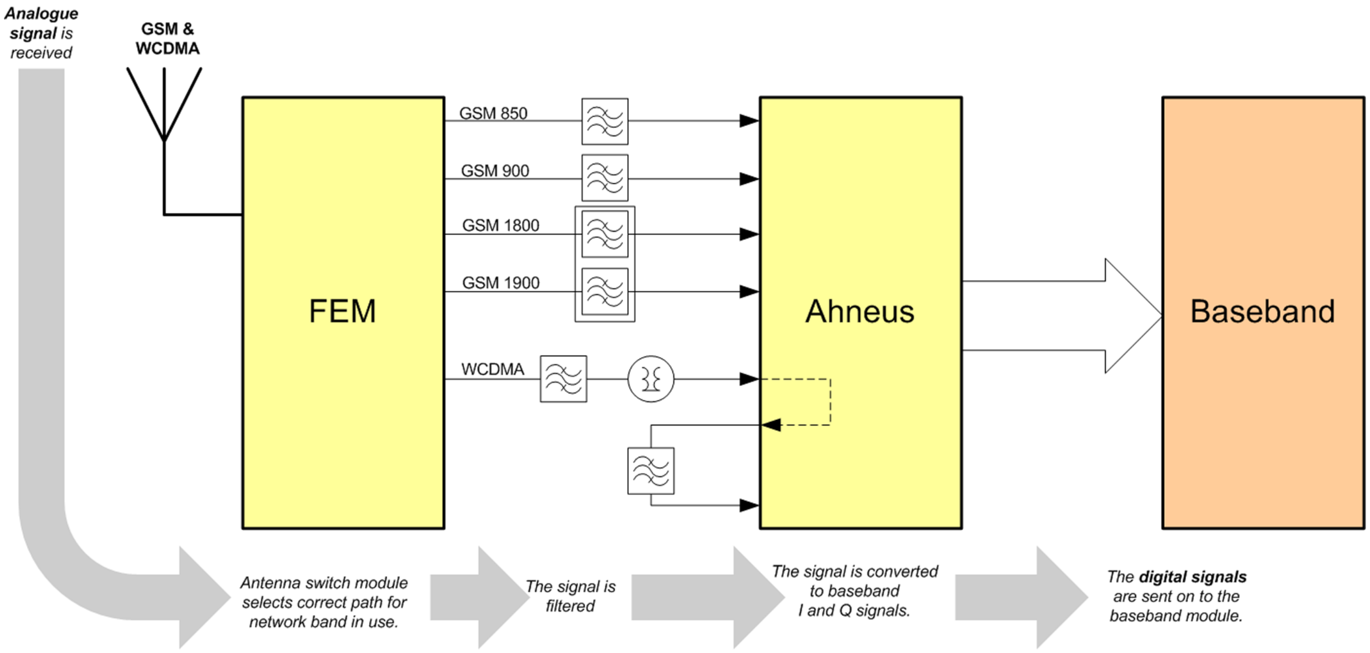
RF description

Receiver (RX)

An analogue signal is received by the phone's antenna. The signal is converted to a digital signal and is then transferred further to the baseband (eg. to the earpiece).

The receiver functions are implemented in the RF ASIC.

Signals with different frequencies take different paths, therefore being handled by different components. The principle of GSM and WCDMA is the same.

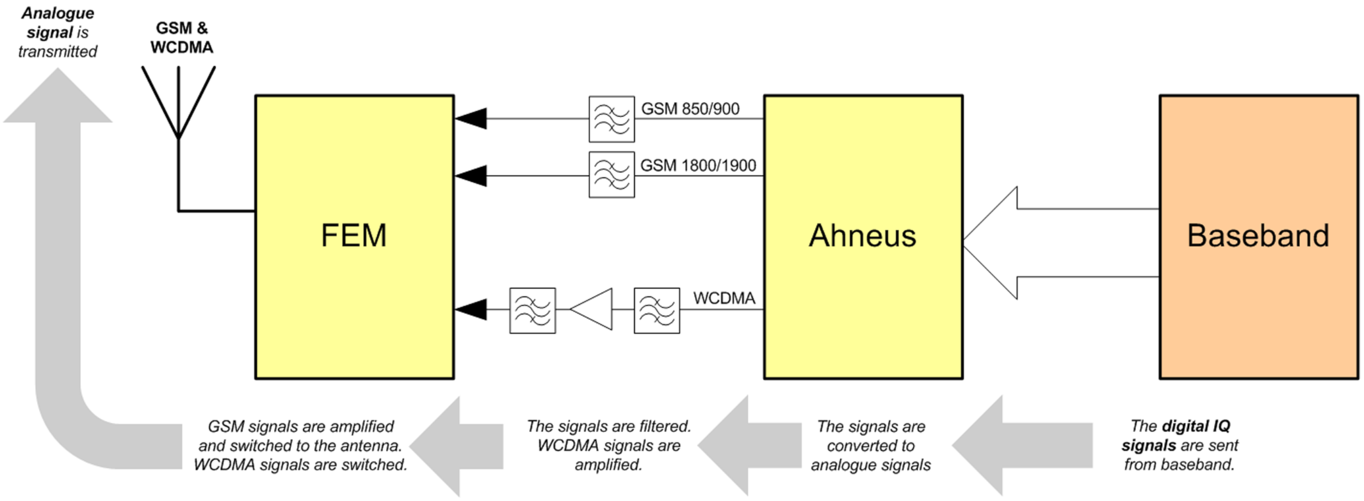

Analogue signal is received
GSM & WCDMA
FEM
GSM 850
GSM 900
GSM 1800
GSM 1900
WCDMA
Ahneus
Baseband
Antenna switch module selects correct path for network band in use.
The signal is filtered
The signal is converted to baseband I and Q signals.
The digital signals are sent on to the baseband module.

Transmitter (TX)

The digital baseband signal (eg. from the microphone) is converted to an analogue signal, which is then amplified and transmitted from the antenna. The frequency of this signal can be tuned to match the bandwith of the system in use (eg. GSM900).

The transmitter functions are implemented in the RF ASIC.

Even though the GSM and WCDMA signals are sent via different components, the principles of the transmission is the same.


Analogue signal is transmitted
GSM & WCDMA
FEM
GSM 850/900
GSM 1800/1900
WCDMA
Ahneus
Baseband
GSM signals are amplified and switched to the antenna. WCDMA signals are switched.
The signals are filtered. WCDMA signals are amplified.
The signals are converted to analogue signals
The digital IQ signals are sent from baseband.

Bluetooth

Bluetooth provides a fully digital link for communication between a master unit (the phone) and one or more slave units (e.g. a wireless headset). Data and control interface for a low power RF module is provided by the module.

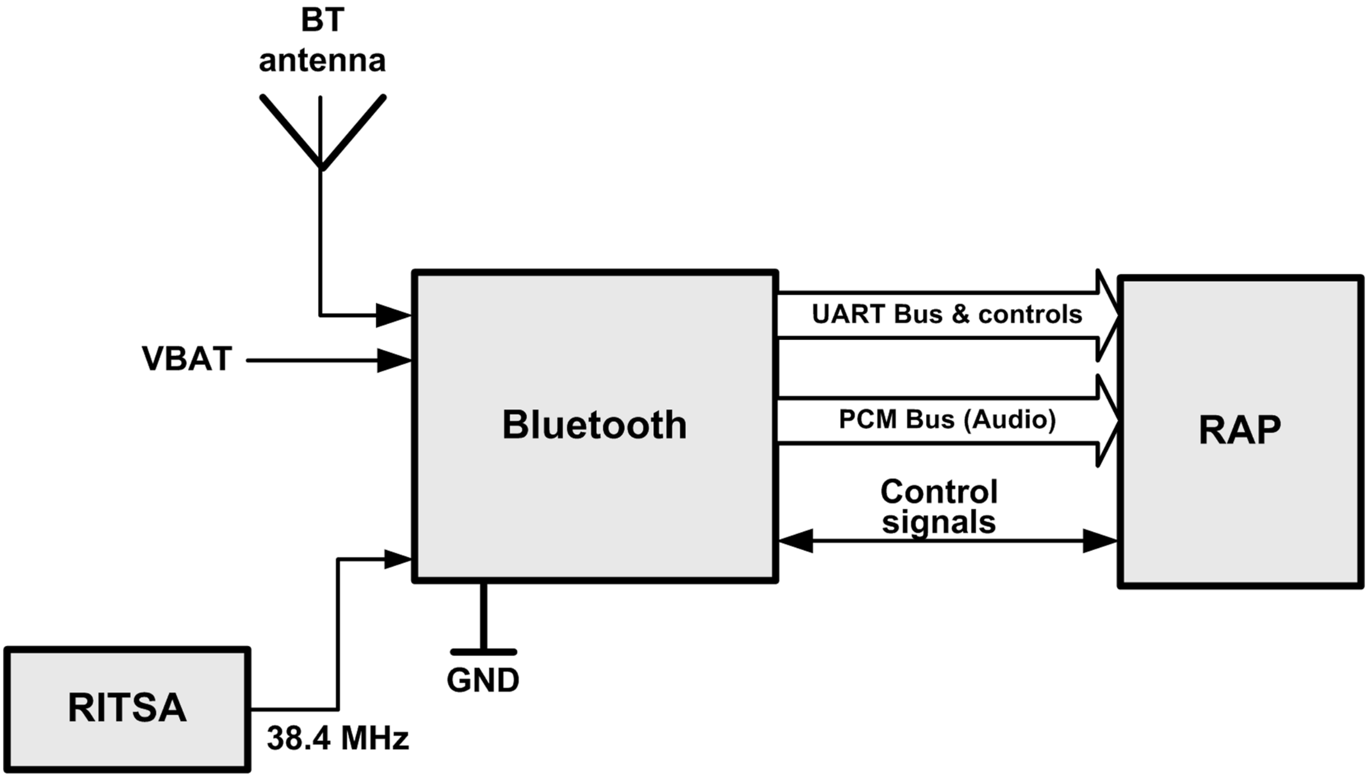

BT antenna
VBAT
Bluetooth
UART Bus & controls
PCM Bus (Audio)
Control signals
RAP
GND
RITSA
38.4 MHz

Figure 24 Bluetooth interface

The Bluetooth has a separate built in antenna and is powered by VBAT. For audio applications the Bluetooth has a PCM data bus. In addition a UART (universal asynchronous receiver/transmitter) is used for data communication and controls.

Technical specifications

Main RF characteristics for GSM and WCDMA band phones

Parameter	Unit
Cellular system	EGSM850/900/1800/1900 + WCDMA band I/V
RX frequency band	EGSM850: 869- 894 MHz
	EGSM900: 925- 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA band I: 2110 - 2170 MHz
	WCDMA band V: 869 - 894 MHz
TX frequency band	GSM850: 824- 849 MHz
	GSM900: 880- 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA band I: 1920 - 1980 MHz
	WCDMA band V: 824 - 849 MHz

Parameter	Unit
Output power	GSM850: +5 ... +33
	EGSM900: +5 ... +33 dBm
	GSM1800: +0 ... +30 dBm
	GSM1900: +0 ... +30 dBm
	WCDMA band I: -50...+21 dBm
	WCDMA band V: -50...+21 dBm
Number of RF channels	GSM850: 124
	EGSM900: 172
	GSM1800: 375
	GSM1900: 300
	WCDMA band I: 277
	WCDMA band V: 108
Channel spacing	GSM 200 KHz WCDMA 4.8 MHz
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16
	WCDMA: 75

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15 °C ... +55 °C	Specifications fulfilled
Reduced performance	55 °C ... +70 °C	Operational only for short periods
Intermittent or no operation	-40 °C ... -15 °C and +70 °C ... +85°C	Operation not guaranteed but an attempt to operate will not damage the phone
No operation or storage	<-40 °C and >+85 °C	No storage. An attempt to operate may cause permanent damage
Charging allowed	-15 °C ... +55 °C	
Long term storage conditions	0 °C ... +85 °C	

Environmental condition	Ambient temperature	Notes
Humidity and water resistance		Relative humidity range is 5 to 95%. Condensed or dripping water may cause intermittent malfunctions. Protection against dripping water has to be implemented in (enclosure) mechanics. Continuous dampness will cause permanent damage to the module.

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Glossary

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A/D-converter	Analog-to-digital converter
ACI	Accessory Control Interface
ADC	Analog-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic ,type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2,UEME and Zocus
CCP	Compact Camera Port
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSR	cambridge silicon radio
CSTN	Color Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analouge converter
DAC	Digital-to-analouge converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo
DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package

DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evaluation
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compability
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GMSK	Gaussian Minimum Shift Keying
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared
IrDA	Infrared Data Associasion
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out

LED	Light-emitting diode
LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architechture
OMAP	Operations, maintenance, and administartion part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency
RF PopPort TM	Reduced function PopPortTM interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multi Media Card
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)

RX	Radio Receiver
SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noice ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WD	Watchdog
XHTML	Extensible hypertext markup language
Zocus	Current sensor, (used to monitor the current flow to and from the battery)